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ORIGINAL MEMOIRS.

STOVAINE SPINAL ANÆSTHESIA.

A REPORT OF TWENTY CASES.

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THE medical literature of the United States has been for a long time signally silent on the subject of spinal anæsthesia. This has been due, I believe, to unsatisfactory results with the drugs commonly in use—namely, cocaine, tropococaine, and novocaine—in regard to both operative and post-operative results.

Some two months ago I had my attention called to stovaine by Dr. Pedro Obarrio, of Panama, who had been using it successfully for some time. Since giving stovaine a trial I am convinced that this drug is far superior to any other I have used or seen used for spinal anæsthesia, and believe that, in most cases requiring operation below the level of the umbilicus, it is superior to anæsthesia by inhalation, for the following reasons:

1. *Heart Action.*—Stovaine has no apparent effect on heart action beyond a slight decrease in the pulse rate, all of our cases having had a rate not above 80 to 90 during operation. Two cases in the small series below—one of strangulated in-

guinal hernia and one of hydrocele—had marked organic lesions of the heart, but in neither case was there any untoward result from the anæsthetic.

2. *Respiration*.—Respiration was not affected, one case only in the series having complained of difficulty in respiration, which lasted but a few moments.

3. *Muscle Rigidity*.—There was no muscle rigidity, the abdominal muscles being more relaxed than under deep ether anæsthesia. The hemorrhoid cases showed a more relaxed condition of the sphincter ani than I have ever seen during safe ether anæsthesia.

4. *Kidney Action*.—The action of the kidneys seems in no way interfered with. The cases in the series passed normal amounts of urine free from albumin or casts.

5. *Vomiting*.—One case only, in the series, vomited during operation, this being more of a regurgitation than true vomiting.

6. *Sweating*.—Sweating during operation is by no means as marked as that generally seen under ether.

7. *Intestinal Peristalsis*.—It has been noticed that peristalsis is less active and that the intestines are more easily controlled by sponges than during ether anæsthesia.

8. *Postoperative Phenomena*.—I have had no case of postoperative vomiting or shock such as follows inhalation anæsthesia, and no case of severe head or back ache. None of the cases had retention of urine such as is common after inhalation anæsthesia in cases of operation on the lower abdomen and rectum. Postoperative pain seems much less intense, and is more easily relieved. There were no cases of fecal or urinary incontinence. Postoperative intestinal paralysis and distention were much less marked than is common in cases following operation under ether anæsthesia. No case in the series has shown a postoperative rise of temperature above 101° F.

Stovaine can be secured in sterile solution, in sealed glass ampullæ, or solutions can be made as the individual surgeon desires. I have used the French preparation in ampullæ of

two sizes, containing two solutions of the drug. The first, containing 10 cg. of stovaine in 1 c.c. normal salt solution, has been used in all cases of abdominal section, herniotomy, etc.; the second, containing 5 cg. of stovaine in 1 c.c. normal salt solution, has been used in more minor work. The necessary apparatus consists of two glass hypodermic syringes of the Luer type, with slip joint, one equipped with the ordinary short hypodermic needle, and one with a slender needle about three inches in length.

Two points of puncture have been used—viz., the lumbar-dorsal, between the twelfth dorsal and first lumbar vertebræ, and the ordinary classical puncture between the third and fourth lumbar vertebræ. The higher puncture gave perfect abdominal anæsthesia, and the lower was used for operations on the rectum, perineum and lower extremities.

Technic.—The patient should be prepared as for inhalation anæsthesia. When placed on the operating table he should be put in an upright sitting posture, with the back well flexed; or, where this is impossible or ill advised, he may be placed on his side with the head and knees drawn well together. The region where the puncture is to be made and the hands of the operator having been thoroughly sterilized, the upper margin of the selected interspace is marked by the left thumb, which should be carefully kept in this position. The skin and deeper structures to the depth of about one inch are now infiltrated with a small amount of 1 per cent. cocaine solution, using syringe No. 1 and short needle. The long needle, detached from its syringe, is now inserted directly in the median line just below the marking thumb, and at an absolute right angle to the spinal column. If correctly placed there should be but little resistance. If decided bony resistance is felt, the needle should be entirely withdrawn and re-inserted. As the arachnoid is entered the cerebrospinal fluid escapes from the needle; this should be stopped as soon as sufficient fluid has escaped to render it certain that the cavity has been entered. The syringe containing the stovaine solution is now applied, the injection made, the needle withdrawn and the site of the

puncture covered with collodion. Anæsthesia is usually complete in about one minute with the 10 cg. dose and lasts at least one hour.

The operations in which I have used this method are as follows:

Appendectomy, 2 cases; vaginal section for pelvic abscess, 3 cases; inguinal herniotomy, 2 cases; salpingectomy (abdominal), 2 cases; abdominal exploratory, 1 case; perineal urethrotomy, 3 cases; amputation, mid-thigh, double, 1 case; Whitehead's operation for hemorrhoids, 2 cases; Andrew's operation for hydrocele, 4 cases. Total, 20 cases.

The cases cited have all made good recoveries. The longest time required for any operation was forty-two minutes.

The advantages claimed for stovaine as a spinal anæsthetic are as follows:

Safety over inhalation anæsthesia in cases showing heart or pulmonary lesion; diminution of surgical shock; ease and rapidity of administration, and the almost entire lack of the distressing postoperative symptoms so commonly following the use of other agents, either by the inhalation or spinal method.

TERMINAL ARTERIAL ANÆSTHESIA.

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SINCE the introduction of cocaine anæsthesia into surgery, there has been a constant tendency to its wider application, even to its use in the so-called major operations. With the exception of spinal anæsthesia, the methods of local anæsthesia now in use are not true anæsthesias, but rather analgesias. That is, the patient, while perceiving no pain, feels distinctly what is going on. This, in nervous patients, is of great moment, causing much discomfort and actual suffering.

What I hope to show is a method of perfect local anæsthesia applicable, it is true, only to a certain group of cases in limited areas of the body. The anæsthesia is induced by the injection of cocaine solution directly into the artery supplying the area to be anæsthetized. The following, printed in the *Lancet-Clinic*, is the original case report.

CASE I.—Male, aged 72. On service of Dr. Robert Carothers, through whose courtesy I am enabled to report this case. The patient had been suffering for three years from a chronic osteomyelitis of the hand, which became so painful as to necessitate an amputation. His age and condition contraindicated general anæsthesia.

Operation at Good Samaritan Hospital July 12, 1909. An Esmarch bandage was applied about the arm two inches below the insertion of the deltoid. Under infiltration anæsthesia, the brachial artery was exposed and the needle of a hypodermic syringe inserted into its lumen, and 1 c.c. of a 2 per cent. cocaine solution injected into the artery in the direction of the blood current. In two minutes anæsthesia was absolute and anti-brachial amputation done without the patient's knowledge.

There are two features of special interest in this case, the rapidity of anæsthesia and the fact that the operation was performed without the patient's knowledge. After the operation had been completed, the patient asked when we would begin. This absolute anæsthesia is a salient feature of this method as well as one of its greatest advantages.

CASE II.—Female, aged 50, service of Dr. Robert Carothers, Cincinnati Hospital. Diagnosis: Osteoma of scaphoid bone.

Operation.—Esmarch strap applied lightly above knee. Under

infiltration anæsthesia the anterior tibial artery was exposed just above the ankle, and 1 c.c. of 1 per cent. cocaine solution injected into the artery. This was immediately followed by complete anæsthesia of the entire foot, during which the osteoma was removed without the patient suffering the slightest pain. The further history was uneventful.

A series of animal experiments was now done to determine the certainty of anæsthesia, its safety and its applicability in operations other than amputations. In all, ten experiments were done. The first series in rabbits, the second in dogs. It will be seen that in operations other than amputations a 2 per cent. cocaine solution is too strong to be consistent with safety, because of the danger of absorption into the general circulation. A 0.5 per cent. cocaine solution was used and found in every way adequate.

In the experiments on rabbits, the femoral artery was selected as the site of injection. The artery was exposed in the upper part of Scarpa's triangle. One c.c. of 0.5 per cent. cocaine solution was injected into the artery in the course of the blood stream and tests for anæsthesia were immediately made. The experiment was in each case controlled by testing the sensibility of the other leg and distant parts of the body. The following uniform results were obtained: Irritation of the anæsthetized leg caused no response; that is, the animal gave no evidence of pain as, for instance, by drawing away the leg. Irritation of the opposite leg was invariably followed by all the evidences of pain.

Experiment 1. The bone was exposed as roughly as possible, the knife rubbed up and down the bone, stripping the periosteum. No pain.

Experiment 2. The femur was broken by manual force and the two ends of the bone rubbed roughly together.

Experiment 3. The foot was charred with a Bunsen flame. No evidence of pain.

Experiment 4. The femoral artery was torn, causing great hemorrhage and necessitating the abandonment of the experiment. This accident, very likely to occur in the thin walled artery of a rabbit, is impossible, as will be shown, in the thicker walled artery of a dog or man.

Experiment 5 and 6 were in all respects similar to the preceding experiments and need not be detailed.

The disadvantage of working on rabbits is manifest, the puncture of the thin walled artery was invariably followed by hemorrhage, necessitating the killing of the animal after the experiment. The perfection of the anæsthesia was determined, it is true, by the rabbits' experiments, but not its freedom from danger. Therefore, another series of experiments was done on dogs and the animals allowed to live.

Experiment 7. Large black-and-tan dog. Under ether anæsthesia, the femoral artery was exposed and 2 c.c. of 0.5 per cent. cocaine solution injected into the artery. The animal was now lifted from the dog board and allowed to recover from the anæsthesia. After fifteen minutes, the dog seemed perfectly normal, running about the room in the usual way. It was particularly noticed that there was an absence of any muscular paralysis. The animal was now tested for anæsthesia. The anæsthetized leg was pinched, scratched and slightly burned. No symptoms of pain were elicited. Irritation of the other leg and other parts of the body gave immediate response. After testing the anæsthesia for half an hour, the wound was united with a continuous suture. During this manœuvre, the most perfect demonstration of the anæsthesia was obtained. The point of injection into the artery lay about in the middle of the wound. The lower half of the wound was sutured without any evidence of pain, the animal lying perfectly quiet and seemingly unconcerned. As soon as the needle entered the skin above the point of injection the animal gave all evidences of severe pain, squealing and struggling. This demonstrated that the anæsthesia extends to the point of injection. The dog was watched for a week, during which no untoward symptoms were evidenced. The animal then escaped none the worse for his experience.

Experiment 8 was in every particular similar to the preceding experiment. The subject was a smaller animal and only one c.c. of 0.5 per cent. cocaine solution was used.

Experiment 9 is, according to present indications, more of scientific interest than of practical value. The dog was large. Under ether anæsthesia the common carotid artery was exposed and two c.c. of 0.5 per cent. cocaine solution injected into the artery. The wound was closed with a continuous suture and the animal allowed to recover from the anæsthesia. After about fifteen minutes recovery was complete and the animal was apparently normal. What was most interesting, was the complete absence of any deviation from normal intelligence. The animal ate and drank from a bowl, also gave every evidence of knowing what was going on about him. The animal was now tested for anæsthesia. The results were most gratifying. There was a complete anæsthesia of the entire head, face and upper part of the neck. The skull was exposed and a piece of bone chipped out. Deep incisions were made into the skin of the face, ears and neck. Even the very sensitive nose and lips were scarified without causing pain. Irritation of other parts of the body elicited symptoms of pain. The bilateral anæsthesia of the face and head may be explained by the very free anastomosis between the two carotid systems. A very interesting feature of this experiment is that sight was not interfered with, as shown by persistence of lid reflexes.

Experiment 10. Medium sized dog. Under ether anæsthesia the

femoral artery was exposed and 1 c.c. of 0.5 per cent. novococaine solution was injected. The experiment was a failure, the leg showing no diminution of sensation.

The nature of the anæsthesia is terminal,—that is, the cocaine is carried by the capillaries to the individual nerve endings. The solution is diffused through the capillary walls into the surrounding tissues, and very little, if any, is returned through the veins to the general circulation. This is shown by the purely local character of the anæsthesia.

The following technic is to be used in man. The main artery supplying the part to be anæsthetized is exposed under infiltration anæsthesia. An Esmarch strap is now bound about the limb some distance above the point of proposed injection into the artery. The Esmarch should be used as in the Bier hyperæmic treatment; that is, snug enough to constrict the veins, but not so tight as to interfere with the arterial circulation. From 4 to 8 c.c. of 0.5 per cent. cocaine in normal salt solution should be injected into the artery in the direction of the blood stream. The needle used should be as fine as possible. After anæsthesia is complete, the Esmarch may be tightened, if perfect hæmostasis is desired. At the end of the operation, the Esmarch is removed and the wound closed. The maximum dose suggested, that is, 8 c.c. of 0.5 per cent. cocaine solution—contains only 0.04 of cocaine, a safe dose. This method of anæsthesia is an ideal one for certain areas of the body where general anæsthesia is contraindicated. It is particularly applicable to the upper extremity, where the brachial, radial or ulnar artery may be exposed with little difficulty. For the larger operation on the lower extremity, where general anæsthesia is contraindicated, spinal anæsthesia seems more desirable, but for the operations about the foot and ankle this anæsthesia has a distinct place. The greatest advantage of this procedure is its safety, which depends on the small quantity of dilute cocaine solution used and its probable diffusion into the tissues.

Goyanes, 1909, describes a method of arterial anæsthesia similar to Bier's venous anæsthesia, in that large quantities of solution are introduced between the two tourniquets.

ANÆSTHESIA BY COLONIC ABSORPTION OF ETHER.

BY WALTER S. SUTTON, M.D.,
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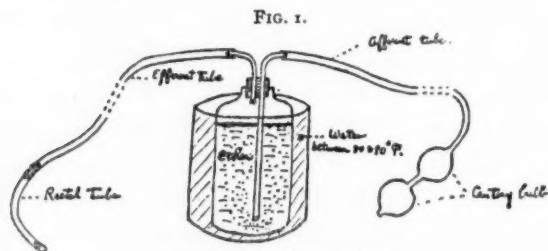
THE high efficiency of the intestinal mucous membrane of vertebrates in general as a transmittor of gases to and from the blood-stream has long been recognized. As early as 1808, Erman⁷ opened the abdomen of *Cobitus fossilis* and observed that when air was swallowed the liver and the intestinal veins of the fish became bright red; while when hydrogen or nitrogen was substituted the color of the organs changed to dark purple. Baumert² in 1855 analyzed the gas passed per rectum by the same fish and found a marked decrease in the oxygen content and corresponding increase in nitrogen when swallowing of air had been prevented for several hours. Jobert⁸ in 1877 discovered that in *Callichthys asper*, a Brazilian fish, air-swallowing is essential to life, the fish dying in about two hours if prevented from the exercise of this form of accessory respiration. In mammals, also, similar phenomena have long been known. Thus, Paul Bert³ in 1870 found that if the trachea of a kitten be clamped the animal will die of asphyxia in about 13 minutes, but if the intestine be inflated with air, life may be prolonged for 21 minutes. A similar absorption of oxygen by the intestinal circulation in man is indicated by the results of Tappeiner¹³ in 1886 who, on analysis of gases from various portions of the alimentary canal of an executed criminal, found in the stomach 9.19 per cent. of oxygen, in the ileum only a trace, and in the colon and rectum none at all; while the percentage of carbon dioxide showed a regular increase from stomach to colon.

Recognizing this activity of the intestinal mucosa the early experimentors with ether as an anæsthetic attempted its

administration by this route. Even in Pirogoff's work on etherization, published in 1847, the method is mentioned as having been used to produce complete narcosis. Since that time efforts have been made in many quarters to establish the real value of the method. In the earlier experiments ether was injected pure or carried into the bowel as a solution or as a mechanical mixture in water. Later, the pure vapor was used, being generated by placing a bottle of ether in a vessel of warm water, and forced into the bowel by the pressure incident to its formation. This latter procedure is the one which was employed in a number of the larger hospitals of our Eastern cities about 15 years ago and which resulted in the general abandonment of the method. In a number of quarters it was found that hemorrhagic discharges followed the use of ether in this manner, and at least three deaths are accredited to it.

DEVELOPMENT OF THE APPARATUS.

After nearly 60 years of desultory experimentations in the hospitals of many countries, it remained for Dr. John H. Cunningham, Jr., of Boston, to introduce a technic which

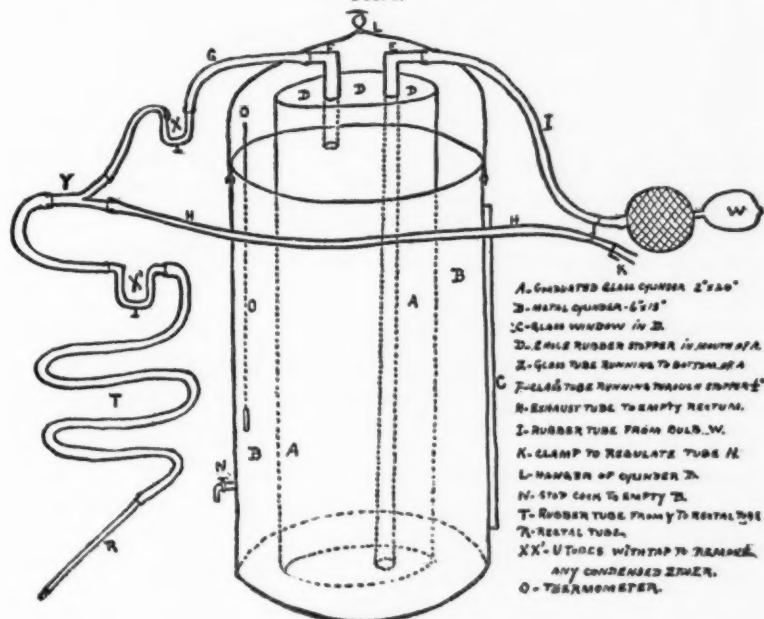


permits administration of ether by absorption from the bowel with safety to the patient.

This technic, which Dr. Cunningham has described in two papers^{5, 6}, was used by himself and his associate Dr. Leahy in 43 cases with satisfaction to the operating surgeons and with no ill-effects to the patients. The salient feature of the method employed by these investigators was the use of air

as a vehicle for conveying the ether into the intestine. As shown by the accompanying sketch (Fig. 1) copied from their publication, the ether was placed in a closed vessel partly immersed in a water-bath at a temperature between 80° and 90° F. Into the bottom of this vessel, air was forced by any convenient means—preferably an ordinary cautery bulb—and, bubbling up through the liquid, was led

FIG. 2.



Leggett's apparatus.

with its load of ether vapor through a rubber tube into the rectum. Too great pressure was prevented by the incompetence of the patient's *sphincter ani* or by the insertion of the finger into the anus beside the rectal tube, allowing the gas to escape between the two.

Incited by the results of Cunningham and Leahy, Dr. Noel B. Leggett, of the Surgical Research Laboratory of the College of Physicians and Surgeons of New York City, after repeated experiments upon animals, conducted a series of cases—some 15 or 16 in number—in the surgical service

of Roosevelt Hospital. The apparatus used by Dr. Leggett, as shown by the reproduction (Fig. 2) taken from his paper⁹ on the subject, was modified from that of Cunningham by the addition of an exhaust tube *H* connecting with the efferent tube to the gut and by the introduction of U-tubes *X* and *X'* for the purpose of collecting any ether which might condense in the tubing as the vapor passed from generator to rectum. This arrangement represented the "state of the art" at the beginning of the series of cases about to be described; and, with the exception of the U-tubes, which have never formed a part of our equipment, was essentially the apparatus used in our earlier cases. In a number of these cases it gave entirely satisfactory results, but in others obstacles were encountered which made difficult or even prevented entirely the attainment of satisfactory surgical narcosis. The study of each of these difficulties has resulted in some modification of, or addition to, the apparatus.

Thus it frequently happened that semi-solid fecal matter escaping with the gas on opening the exhaust tube became lodged in the tubing and prevented the free passage of gas in either direction. To prevent this, a special form of tube was made and arranged to stand between the patient's thighs close to the anus in such a position that any fluid or semi-solid matter passing in either direction would drop down into the branch of the tube leading to the exhaust. Also the calibre of the entire exhaust tube was made considerably greater than that used for carrying the ether vapor to the intestine. To meet the changed condition brought about by the new position of the branch tube, the rectal tube was shortened to about 8 inches in length; and since the one or two eyes of the ordinary rectal tube frequently became closed by prolapse of rectal mucosa or by the lodgement of fecal matter, tubes with from 5 to 7 eyes have been adopted. Again, on account of the frequency of leakage around the rectal tube, preventing the maintenance of sufficient pressure to inflate the gut, a bulb from $\frac{3}{4}$ to 1 inch in diameter has been made on the tube at a point which in use lies just

inside the sphincter. Still another accident which at times prevented free passage of gases to and from the patient was the occasional compression, by the operator or by the weight of the patient's thigh, of the flexible afferent and efferent tubes.* This difficulty was met by winding the exposed portions of the tubing with stiff wire or by the substitution of tubing having a very heavy wall.

The observation that in some cases a diminution of gas-pressure in the gut resulted in a deepening of the narcosis led to recognition of the fact that too great pressure produces ischæmia of the gut and a consequent interruption of absorption. To guard against this accident a mercury manometer was added to the apparatus so that the pressure of the gas in the gut might always be kept below that of the blood in the intestinal capillaries. For the more easy recognition of the escape of gas on opening the exhaust, the distal end of the latter was immersed in a bottle of water placed under the operating table; and to prevent confusion as to whether the gas there seen or heard to escape is coming from the gut or from the generator, a combination clip was devised which necessitates the closure of the afferent tube before the efferent one can be opened.

Since, as will be explained later, it has sometimes been necessary to administer a certain amount of the anæsthetic by mouth as a supplement to the quantity absorbed by the intestine, a tube has been provided by means of which ether vapor can be diverted from the main afferent tube and allowed to escape into the mouth or nose of the patient. Finally, on account of the instability of the cylinder form of ether generator and of the more and more frequent use of oxygen as a vehicle for the ether vapor, a compact metal generator has been devised, which, though no more efficient in maintaining narcosis than the cylinder form, presents a number of advantages which will be detailed later.

* These terms are not used in the sense in which they are employed by Cunningham as afferent and efferent to the vapor generator, but as afferent and efferent to the patient.

DISCUSSION OF CASES.

Up to the present time I have administered ether by this method to about 140 cases on the surgical service of Roosevelt Hospital. Of this number, careful records were taken of the first 100 cases. Of the remaining 40, mostly private cases, no detailed records have been made. I may say, however, that all were satisfactory and that untoward results occurred in none. In only one case—the second of the series—was an attempt made to administer the anæsthetic per rectum from the beginning. This proved so slow and was so uncomfortable and distasteful to the patient that after about 20 minutes a cone was used to complete the initial establishment of anæsthesia. Inasmuch as there is no real indication for beginning the administration by rectum, I have never made a second attempt to do so.

Of the 100 cases in the recorded series, 91 were ward patients and 9 private patients. The age range was 2 to 77 years. The character of the operations done was as follows:

Tumors, glands, etc., of neck.....	31
Amputations of breast.....	9
Goitres and thyroglossal cysts.....	8
Craniotomies	6
Correction of old fractures of limbs.....	5
Resections, sutures and osteotomies of inferior maxilla..	5
Partial excisions of tongue.....	4
Staphylorrhaphy	4
Tracheotomy	3
Mastoid	3
Inguinal hernia	2
Removal of parotid tumors.....	2
Resection and osteotomies of superior maxilla.....	2
Removal of Gasserian ganglion.....	2
Skin grafting	2
Orchidopexy	1
Hydrocele	1
Appendectomy	1
Nephrotomy	1
Ludwig's angina	1
Enucleation of eye	1
Resection of knee.....	1

Cervical laminectomy	I
Axillary adenitis	I
Excision of sternomastoid.....	I
Plastic for stricture of œsophagus.....	I
Laryngectomy	I
Neurorrhaphy	I

The longest operation of the series consumed 2 hours and 20 minutes, the shortest, 5 minutes, the average time being 53 minutes.

The average consumption of ether was 87 grams per hour in the 64 consecutive cases in which record of this point was kept.

Twelve of the 100 cases had a preliminary injection of morphine and scopolamine.

In 25 cases, oxygen was used as a vehicle for the ether vapor.

Forty-three cases had at some time in the operation a supplementary administration by mouth of ether or chloroform.

Twelve belched gas from the stomach in the course of the anæsthesia, indicating a possible distention of the small intestine with regurgitation of the gas from the stomach. Of these only 4 occurred in the 71 cases following the adoption of a 20 mm. maximum pressure in the bowel.

Only 18 cases showed any perspiration whatever and in none of these was there profuse sweating.

Forty-three cases vomited or regurgitated stomach contents after operation; of these several disclaimed any sensation of nausea.

Twelve had abdominal pain.

Five had bloody stools or blood-streaked return from the post-anæsthetic enemata. All cleared up in from a few hours to three days and in none was the loss of blood accompanied by noticeable weakness or abdominal pain.

The most severe of the cases continued to pass small quantities of blood for three days during which she also vomited persistently. This case, Case XXVI of the series, was the last save one in which any hemorrhage (beyond the

negligible amount occasionally caused mechanically by the rectal tube) has occurred.

CASE XCVII, as an incident to the introduction of a new form of ether generator, was treated to an excessively concentrated vapor, so that great care was necessary to prevent narcosis from becoming too deep. In the first three days following the operation, this patient had five bloody stools. He felt no discomfort, however, and was discharged on the fifth day in perfect general condition.

In the series of cases to date there have been 5 deaths from all causes. In none of these, in the judgment of the operating surgeon, was the method of administering the anæsthetic a contributing factor. A brief statement of the conditions in each of these cases follows:

CASE I.—Large, heavy man, moderately alcoholic. Operation, partial excision of the tongue for epithelioma. Patient somewhat blue and pulse was small and rapid throughout operation. Died—apparently of operative shock about two hours after return to ward.

CASE II.—Large, heavy man. Age 35. Moderately alcoholic. Operation, tracheotomy and removal of cervical glands as a preliminary to laryngectomy for carcinoma of larynx. Anæsthetic was "shallow" throughout, patient coughing and groaning frequently. Made prompt ether recovery but died two days later of pneumonia.

CASE XXV.—Fairly well nourished man. Age 53. Moderately alcoholic. Operation, hemi-excision of tongue and removal of right cervical glands for epithelioma. Patient took initial anæsthetic slowly and was markedly cyanotic. Color and general condition improved after beginning of the administration per rectum. Anæsthesia was shallow throughout, patient swallowing frequently. Late in operation there was marked hemorrhage, and shortly afterward—1 hour and 35 minutes after the beginning of the operation—the patient died.

CASE XLIV.—Muscular man. Age 24. Brought to hospital almost moribund with compound depressed fracture of skull. After operation lasting 35 minutes the patient left the table improved but never regained consciousness and died two days later.

Autopsy showed extensive fractures of vault and base with extensive laceration of brain and marked subdural and epidural hemorrhage. The colon was normal, showing no injurious effects from the ether.

CASE XLVII.—Slender negro. Age 31. Brought to hospital in ambulance with extreme dyspnœa of sudden onset. Operation, low tracheotomy done in sitting posture on account of orthopnœa. On account of this position, the rectum was compressed by the weight of the upper bowel and introduction of ether vapor and oxygen into the colon was almost impossible. The operation gave little relief but ether recovery was satisfactory. Dyspnœa and cardiac weakness progressively increased and two days later the patient died. Autopsy showed a large false aneurism of the descending arch of the aorta.

One other death has occurred after administration of ether by this method in Roosevelt Hospital. This case though administered by another member of the interne staff came under my own observation both during and after the operation. The patient was a well-nourished child of five years which had been anæsthetized on two previous occasions for the correction of hare-lip and the removal of adenoids. The operation in question was a staphylorrhaphy lasting about 50 minutes. Throughout the operation there was a noticeable difficulty in maintaining a smooth narcosis, the latter being too deep and too shallow by turns. In the course of the shallow intervals a little chloroform was given several times on a "sponge-stick." There was no excessive loss of blood. Toward the close of the operation, the patient's color became very bad and the pulse small and rapid. She was hurried to the ward, stimulated and given external heat. In the course of a half hour she became restless and talkative, calling for water and asking to be taken home, but apparently recognizing no one about her. She did not vomit. The pulse continued rapid and small and an intravenous infusion was given with slight temporary benefit. After this, she gradually relapsed again into unconsciousness and about two hours after the operation, she died. Unfortunately an autopsy could not be obtained.

It is the author's belief that this method, safeguarded by the improved apparatus to be described hereafter and by the use of oxygen as a vehicle for the ether vapor, is one of extreme safety in the absence of definite intestinal lesions.

THE PHYSIOLOGY OF COLONIC ANÆSTHESIA.

Theoretically the administration of any anæsthetic should presuppose a full knowledge of the physiological action of the drug on the part of the anæsthetist. Practically, however, in the case of pulmonary anæsthesia, this knowledge may be, and, in the vast majority of cases is, dispensed with in favor of an accurate knowledge of the symptoms of incomplete and excessive narcosis and the practical means of correcting each. This knowledge, gained by extensive observation and supervised experience in the pulmonary method of administration, is not sufficient basis for the undertaking of administration by the colonic method.

In the pulmonary method the drug is taken in by the automatic respiratory efforts of the patient, and is eliminated in the same way if pure air be only substituted for the anæsthetic mixture. No anæsthetic-containing reservoir remains to continue imparting the drug to the blood plasma. Further, as the only means of elimination of the anæsthetic is the same as the means of absorbing it, only so great an amount of the drug need be given as is necessary to produce in the general circulation the required one-fourth per cent. for the narcotization of the central nervous system (cf. Overton¹¹). Also, the absorbing surface of the lungs is so great and so well adapted to the purpose that a comparatively low concentration of anæsthetic vapor in the respired air is sufficient to produce the required percentage in the circulating blood.

When we turn to a consideration of the colonic method of administration we find all these conditions changed. The drug cannot be taken in by the muscular action of the patient nor can any unabsorbed excess be eliminated in that way. In case of over-deep narcosis the unabsorbed residue of the drug must be evacuated by the active intervention of the operator. There must be considered in the use of this method, the fact that the blood after leaving the intestine with its load of ether is obliged to pass through the lungs before reaching its goal

in the central nervous system, and that in so doing a considerable portion of the contained ether will be eliminated into the air. The concentration of the drug at the point of absorption, therefore, may not be the one-fourth per cent. of the pulmonary method but one-fourth per cent. plus the percentage necessarily lost by exhalation.* Again, the absorbing surface of the colon is much smaller than that of the lungs and the arrangement of the vessels perhaps less favorable to gaseous interchange, so that a higher partial pressure of the anæsthetic vapor, in other words a higher concentration, is required.

Each of these differences requires the intelligent attention of the anæsthetist. Since the anæsthetic mixture must be forced into the intestine, we are immediately confronted with the question of the proper degree of pressure to be used in the process. Sufficient must be used to obtain moderate distention of the entire colon else the available absorbing surface will be too small. Too much pressure must not be exerted lest by over-distention the vessels of the gut be flattened out, circulation impeded or abolished, and absorption minimized; and the ischæmic mucosa left unprotected by its normal circulation to resist the irritant effects of the ether vapor. The contention may be raised that experiments in which narcosis has been produced by the use of excessive pressure are sufficient to disprove this statement. The error in this contention arises from the fact that excessive pressure breaks down the resistance of the ileocæcal valve, as observed by Leggett on dogs, and that the narcosis is obtained by absorption under diminished pressure from the coils of the small intestine. The author's attention was first directed to the

* In connection with this point it is important for those who make use of the colonic method of etherization to watch for symptoms of the so-called "delayed ether poisoning," since from the foregoing it is plain that the liver—the great sufferer in this condition—is treated to a higher concentration of ether than in the same grade of narcosis from pulmonary administration. No case of this kind has come to the author's attention, however, unless the peculiar death mentioned on page 465 has some affiliation with this class of cases.

necessity for the use of a moderate pressure by the repeated observation that reduction of pressure often resulted in deepening of the narcosis.

The optimum pressure to be maintained in the colon has been determined experimentally to be about 20 mm. of mercury, which is approximately equal to the sum of the positive pressure in the intestinal capillaries and the negative pressure in the portal vein. This would be varied according to the blood-pressure of the patient; *i.e.*, should be reduced to 10 or 12 mm. in young children and may be increased in individuals with abnormally high blood-pressure.*

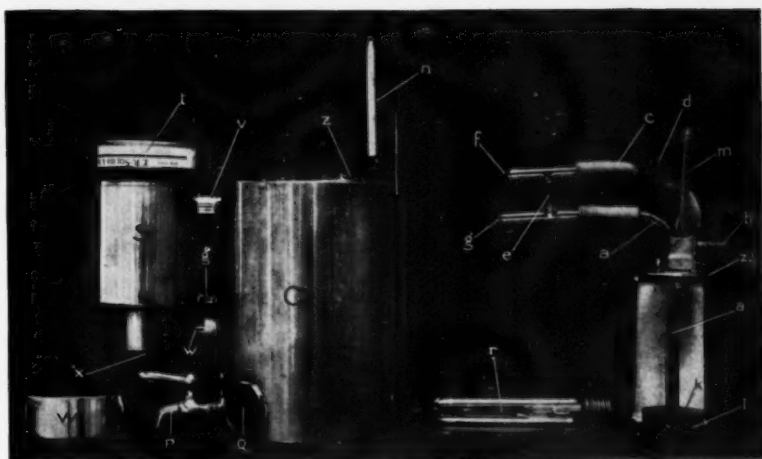
On account of the inevitable loss of ether from the blood in its passage through the lungs, it is sometimes necessary to adopt means, to be mentioned later, for keeping the respired air more or less laden with ether.

For the same reason and because of the smaller and less efficient absorbing area of the colon as compared with that of the lung, a relatively high concentration of the anæsthetic mixture must be used. To meet this last requirement, a number of early investigators and unfortunately, some recent ones^{1, 10} as well, adopted the expedient of passing *pure* ether vapor into the gut under the pressure incident to its generation. This doubly dangerous procedure has resulted in a number of deaths, in one of which (reported by Professor Baum, *l.c.*) autopsy showed a gangrenous and perforated cæcum and general suppurative peritonitis.

The danger of too great concentration of ether is obviated in the method used by the author by employing oxygen (or air) as a vehicle and by keeping the ether from which the vapor is derived well below its boiling point. By maintaining a uniform temperature in the ether, with a fairly constant flow of oxygen and a definite period of association of the oxygen stream with the liquid ether, a fairly constant degree of concentration may be attained.

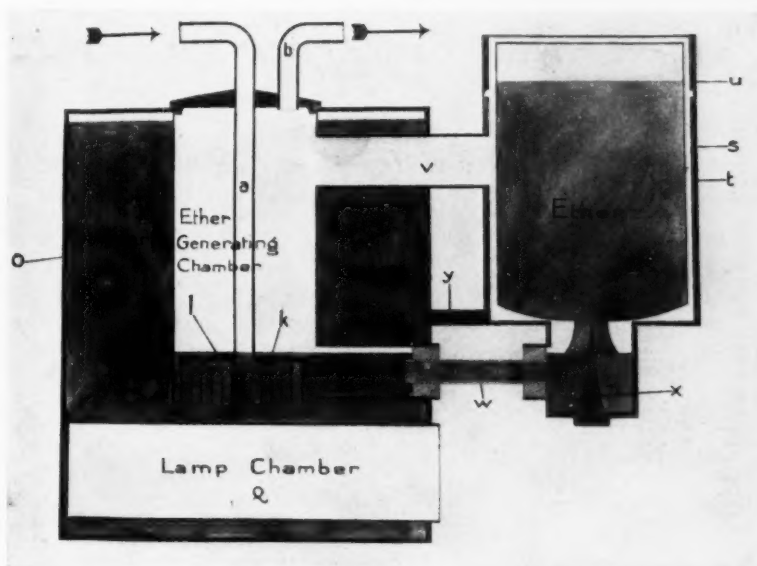
* In connection with this question it is well to have in mind the experiments of *Quirin*,¹² in one of which a normal healthy cat having a blood-pressure of 85 mm. died after 5 minutes of an intra-abdominal pressure of 10 mm.

FIG. 3.



Parts of vapor generator.

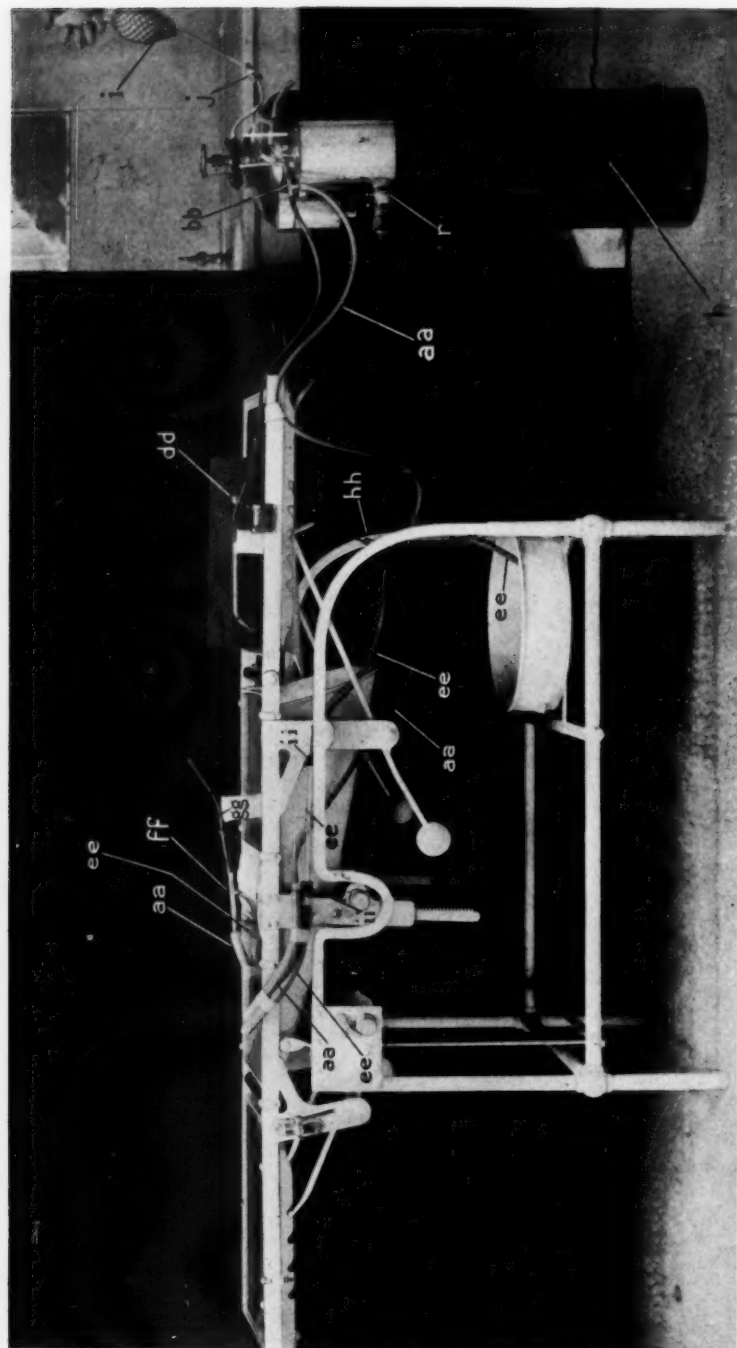
FIG. 4.



Schematic section of vapor generator.

a, Oxygen (or air) inlet; b, Connection to afferent tube system; c, By-pass for inflating intestine with pure oxygen (or air); d, Clip for closing by-pass; e, H-tube connecting oxygen tank and air bulb with generator and by-pass; f, Connection of H-tube with air bulb; g, Connection of H-tube with oxygen tank; h, Disc forming top of spiral wiew; i, Spiral wiew; m, Manometer; n, Thermometer projecting out of water-jacket; o, Water-jacket; p, Cock for draining water-jacket; q, Lamp chamber in water-jacket; r, Tubular incandescent-bulb for heating water-jacket; s, Ether reservoir; t, Ether can inverted in reservoir; u, Screw cover for reservoir; v, Metal tube connecting upper part of ether reservoir with upper part of generating chamber; w, Glass tube connecting ether reservoir with generating chamber below level of ether; x, Flattened spike for perforating seal of ether can; g', Metal brace between reservoir and generating chamber; z, Cover over hole for filling water-jacket; zz, Cover of generating chamber.

FIG. 6.



aa, Afferent tube system; *bb*, T-tube for connecting accessory mouth tube; *dd*, Clip for same; *ee*, Efferent tube system; *ff*, Y-tube; *gg*, Rectal tube; *hh*, Combination clip on afferent and efferent tube system; *i*, Air bulb; *j*, Clip on air-connection which is closed when oxygen is being used, to prevent leakage through air bulb; *ii*, Sliding clip for holding tube; *r*, Oxygen tank. Tell-tale bottle not shown, should sit in drip pan of operating table and receive distal end of efferent tube.

THE AUTHOR'S APPARATUS.

The original apparatus in use at Roosevelt Hospital was that of Cunningham, the simplest possible means of forcing air through warmed ether and carrying the mixture into the intestine—plus a branch tube used for exhausting the contents of the gut when occasion required. The latter feature introduced by Leggett is one of the valuable points in the apparatus with which this chapter is concerned.

The complete apparatus may be regarded as made up of three parts: (1) a generator in which the mixture of oxygen and ether is produced, (2) an afferent tube system which carries this product into the intestine, and (3) an efferent tube system for the purpose of exhausting the contents of the gut.

The Generator.—This portion of the apparatus consists of a small generating chamber proper surrounded by a water-jacket and connected with an ether storage chamber which automatically maintains a given level of ether in the generating chamber. The arrangement and working of the various parts will be most readily understood by a glance at the photograph of the dissected apparatus (Fig. 3) and the schematic sagittal section shown in Fig. 4. Only one feature will require special description. This is the spiral wier, *l*, which determines the prolonged intimate contact of the oxygen (or air) with the fluid ether. This device consists of spirally wound strip of thin brass three-quarters of an inch wide and about 14 inches in length, soldered to the bottom of the circular disc, *k*, with which the oxygen inlet tube, *a*, connects.

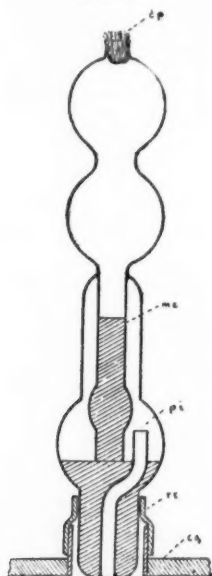
The level of the ether in the generating chamber is automatically maintained at such a height as just to cover this wier and disc. The oxygen (or air) is admitted to the apparatus through this tube, *a*, emerges below the level of the ether under the plate, *k*, and finds its way to the surface only after traversing all the windings of the spiral. This necessitates intimate association of oxygen with ether for a distance of 14 inches and has been shown experimentally to bring about a complete saturation of the former with the latter.

The ether-saturated oxygen rises into the upper part of the generating chamber and is carried by the tube, *b*, into the afferent tube leading to the intestine. The main body of the ether remains in the original package, *t*, which is inverted in the ether reservoir, *s*. To charge the generator, a sealed ether can (this apparatus is designed to take a Squibb's 250-Gram can) is inverted in the reservoir, the seal being penetrated in the act by a flattened spike, *x*, which projects from the bottom of the reser-

voir. A twist of the can then serves to ream out a fair-sized opening. Ether then flows out into the lower part of the reservoir and into the generating chamber until it has reached a level above the perforation in the seal when, the entrance of air being interrupted, the outflow of ether ceases until the level of the fluid has been again reduced so as to allow more air to bubble up into the dome of the ether can. This principle of the kerosene "student lamp" must be familiar to all my readers. Before any pressure is put on the generating chamber, the cover, *u*, of the ether reservoir must be screwed on air-tight.

Surrounding the generating chamber is the water-jacket, *o*, which is maintained at a temperature of 88 to 90 degrees (not higher) by the

FIG. 5.



Sectional view of manometer. *mc*, Mercury column; *pi*, Pressure inlet; *cp*, Cotton plug in pressure vent; *cg*, Cover of generating chamber; *ri*, Short piece of rubber tube connecting manometer with cover.

10 candle power tubular incandescent electric lamp, *r*, inserted into the blind tube, *q*. A thermometer, *n*, projecting from the top of the water-jacket readily shows the temperature of the contained water.

A manometer, *m*, projecting from the cover, *ss*, of the generating chamber, shows at all times the pressure maintained in the generating chamber and hence in the intestine of the patient. This manometer, of which an enlarged sectional drawing is shown in Fig. 5, also serves the purpose of a safety valve, being so constructed that when the pressure reaches a point a few millimeters above the optimum, the oxygen-ether mixture of the generating chamber is permitted to bubble up through the mercury and escape into the air. This point is of importance since

the needle-valve of the oxygen tank may be accidentally opened too wide, which, in the absence of such a safety-valve would put a dangerous pressure on the gut. When such excessive pressure has subsided, the mercury falls back from the upper chamber of the manometer and the safety-valve is closed.

The H-tube, *e*, makes it possible to have, at the same time, means of passing either oxygen or air through the generator and also of inflating the intestine with pure oxygen or air without appreciable admixture of ether. This latter procedure is accomplished by simply opening the pressure-clip, *d*, which allows the oxygen or air to pass into the afferent tube and on into the intestine without making its way through the generator itself. The generator may be either hung by a bracket from the oxygen tank as shown in Fig. 6, or set upon a small table.

For those who wish to make their own apparatus a simpler form of generator will be found quite satisfactory. This may be made by the use of the spiral wier in any wide-mouthed bottle capable of containing 250 to 400 Grams of ether with 4 or 5 inches of free space between the

FIG. 7.



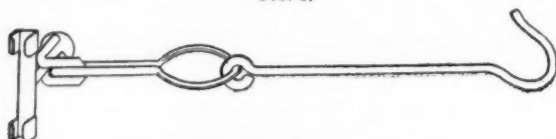
Sectional view of Y-tube. *ac*, Afferent connection; *ec*, Efferent connection; *rc*, Rectal tube connection; *br*, Brace.

fluid and the cork. The manometer is inserted through the cork and the proper afferent connections provided. In the place of the water-jacket a pail of warm water is provided and the bottle partly immersed in it. The temperature is registered by a floating thermometer and is kept up to the proper point by occasional addition of very hot water.

The Afferent and Efferent Tube Systems.—These, as will appear from a glance at Fig. 6, run a parallel course for the greater part of their length—the efferent or exhaust tube being led to the head of the table in order that it may be controlled by the anæsthetist sitting in that situation. The afferent tube is of small calibre since it conveys only gas, while the efferent tube, which is frequently called upon to conduct water and semi-fluid fæces, must have a much greater inside diameter. Both tubes have very thick walls in the portion which passes over the edge of the table and under the patient's thigh. This is to obviate the danger of compression in this situation. The rectal tube is a short single tube having a bulb about 3 inches from its outer end and supplied with from 5 to 7 fenestræ. This bulb in use aids to prevent leakage in case of a lax sphincter, while the multiple fenestræ are a safeguard against closure of the tube due to prolapsed mucosa or to

fecal particles when the exhaust tube is opened. Communication between the rectal tube on the one hand and the afferent and efferent tube system on the other is established by the use of a Y-shaped tube of glass or metal (Fig. 7) which stands horizontally between the patient's thighs close to the anus. The upper straight arm connects with the afferent tube while the lower curved branch leads to the efferent connection. By reason of its position and construction this Y-tube acts as a trap to catch either

FIG. 8.

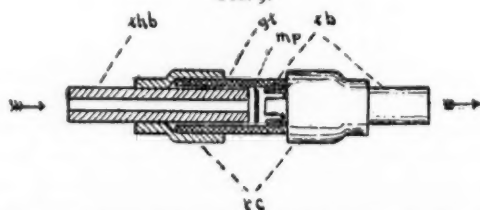


Combination clip with hook.

condensed ether from the afferent tube or fluid or semi-fluid matter coming from the rectal tube when the exhaust is opened.

A strong glass tube is introduced into the efferent system as shown at *ee*, Fig. 6. This serves the double purpose of preventing a sag in the exhaust tube at this point and of furnishing a rigid support for the sliding hooks *ii*, which form the principal means of attaching the apparatus to the table. The end of the efferent or exhaust tube is immersed in a few inches of water in the bottom of a wide-mouthed bottle which sits either on the floor under the head of the table or in the drip-pan connected with the latter. This bottle serves both as a collector of any

FIG. 9.



Check-valve used in afferent tube when coughing is to be permitted (partial sectional view). *thb*, Thick-walled brass tube connecting with generator; *tb*, Thin-walled brass tube notched on end toward valve connecting with main afferent tube; *gt*, Glass tube surrounding valve hamper; *mp*, Mica-plate valve; *rc*, Cuffs of rubber tubing connecting glass and brass tubes.

fluid return from the intestine and as a "tell-tale," since the amount of gaseous return following the opening of the exhaust is readily appreciated when it is seen or heard bubbling through the water. Continuous leakage from the exhaust is prevented by a spring-clip, *hh*, which I have modified as shown in Fig. 8, so that the afferent tube is held in relation with one of the finger-rests of the clip. This relation of clip and afferent tube insures the closure of the latter by the same finger pressure which opens the former. Gas is thus prevented from entering the intestine as long as the exhaust is open. For the sake of keeping it in a definite

position, this combination clip is attached to the table by a long wire hook. Since, in some cases, it is necessary temporarily to supplement the colonic administration by the addition of ether by mouth, a T-tube, *bb*, Fig. 6, is placed in the efferent system close to the generator and a small rubber tube led off and closed by a spring clip.

In mouth and throat cases, where it is desirable for the patient to retain an active coughing reflex, it has proved of advantage to introduce a small mica-plate check-valve beyond the origin of the accessory mouth tube. Coughing produces a very marked increase in intra-abdominal pressure and in some cases before the introduction of this valve a paroxysm of coughing has resulted in the driving of fecal-stained fluid back into the generating chamber. With the check-valve as shown in Fig. 9, this cannot occur. When violent coughing is permitted, it is necessary to open the exhaust during each paroxysm lest the rectal tube be extruded by the effort; or an automatic safety valve may be arranged by leaving off the exhaust clip and immersing the weighted end of the exhaust tube in about 18 inches of water. This height of water will be sufficient to prevent escape of gas at 20 mm. pressure but readily permits escape at the higher pressure incident to coughing. When this device is used the intestine may be emptied of gas by simply raising the end of the exhaust tube to the surface of the water.

TECHNIC OF METHOD.

Preparation of the Patient.—As observed by all workers with intestinal anæsthesia, one of the most important considerations is thorough cleansing of the colon. This is accomplished by a cathartic of castor oil given the night preceding the operation and following in the morning by high soap-suds enemata repeated until the return is clear. In the author's cases three enemata $1\frac{1}{2}$ to 2 hours apart have been regarded as the minimum number. In alcoholic and very muscular subjects and in operations on the mouth or upper respiratory tract, it has been found useful to give $\frac{1}{6}$ to $\frac{1}{4}$ gr. of morphine and $\frac{1}{120}$ to $\frac{1}{100}$ gr. of scopolamine hypodermatically, 1 hour before operation.

The Administration.—Before the patient is brought to the etherizing room, the anæsthetist affixes the apparatus to the table as shown in Fig. 6, except that the rectal tube is not attached and the Y-tube and its connections are allowed to hang down at the side of the table while the accessory mouth tube is permitted to hang from the side of the generator. The ether reservoir is charged if it does not already

contain ether left from a previous case, the water-jacket filled with water at about 90 degrees and the electric lamp connected with a plug in the wall, *but not lighted at this time*. The end of the exhaust tube is placed in the "tell-tale" bottle under the table.

The anæsthetic is then started by the pulmonary method and carried to a stage of partial relaxation when the patient is brought to the operating room and placed on the table. The rectal tube—well greased, is then quickly inserted until the bulb lies just inside the sphincter, the anæsthetist before starting the initial anæsthetic having protected his left hand with a rubber glove for this purpose. The patient's left thigh is then raised and the branch tube brought under in to its proper position and connected with the rectal tube. For this brief period, the cone has been held over the patient's face by a nurse. The anæsthetist then removes his rubber glove, takes his place at the patient's head and slowly turns on the oxygen. As soon as this is done the cone may be removed from the patient's face. If the operation does not involve the patient's mouth, it is best to cover the latter and, if possible, the nose as well, with 3 or 4 large sterile towels, which by causing a certain amount of rebreathing, impede the elimination of ether from the lungs. If during the change from the pulmonary to the colonic method, the patient has "come out" and begun to make troublesome voluntary movement, he can be quickly "put under" by admitting ether vapor to the space under the towels through the accessory mouth tube.

As soon as pressure in the colon has been raised to the required 20 mm. the exhaust should be opened and the gut allowed to empty itself. This process of filling and emptying the intestine should be repeated three or four times in order to eliminate as thoroughly as possible the natural gases of the bowel. The needle valve of the oxygen tank is then set at a point which just maintains the required 20 mm. pressure and usually demands little or no further adjustment during the rest of the operation. If the patient tends to come out from the influence of the anæsthetic the bowel may be

emptied from time to time to carry out any intestinal gases which tend to dilute the anæsthetic mixture. If, on the other hand, the anæsthesia continues sufficiently deep, no further use of the exhaust need be made until the end of the operation. This is because the oxygen is absorbed by the bowel with the same rapidity and ease as the ether vapor so that no residue remains.

When air is used as a vehicle, the bowel must usually be emptied every 5 or 10 minutes, as in this case a nitrogen residue tends to accumulate and act as a diluent of the freshly added anæsthetic mixture. Whenever possible, oxygen should be used as a vehicle in place of air—first, because it reduces the dangers of anæsthesia; secondly, because it greatly diminishes the rapidity and depth of respiration, in some cases even causing the phenomenon of apnoea of hyperoxygenation, thus greatly reducing the loss of ether through the lungs; and, thirdly, because of its obviating the necessity of frequent use of the exhaust and hence contributing to the smoothness of the anæsthesia and the comfort of the anæsthetist. It was not possible in our cases to estimate exactly the amount of oxygen consumed as the same tank was used for other purposes, but the quantity was surprisingly small—the cost reaching something like 10 or 15 cents per hour.

In the ordinary case, a smooth anæsthesia continues from this point with little further active intervention on the part of the anæsthetist. The needle valve of the oxygen tank may require occasional adjustment and the thermometer must be watched to see that the temperature of the water-bath does not become too high. When the temperature tends to rise above 90 degrees the incandescent lamp may be partly withdrawn from the water-bath or it may be turned off for a few minutes, being lighted when the mercury has fallen to 88 or 89 degrees. If, with a lighted 10 candle power lamp inserted the full length into the water-jacket a temperature of 90 degrees cannot be maintained, it is certain that there is a leak in the apparatus or from the patient's sphincter, necessitating an excessive flow of oxygen to maintain the required pressure,

and hence an excessive evaporation of ether with its accompanying increase in refrigeration.

Too shallow narcosis is met by adjusting the face towels so as to cause increased rebreathing of the exhaled ether (this does not cause cyanosis on account of the constant absorption of oxygen from the bowel), and, if this is not sufficient, by introducing anæsthetic mixture under the towel from the accessory mouth tube.

Too deep narcosis is met by temporarily shutting off the stream of oxygen and allowing the exhaust to remain open for a short time, or by markedly reducing the pressure without opening the exhaust.

The depth of narcosis is determined by the pupils, which are usually at maximum contraction in complete anæsthesia by this method (if morphine and scopolamine have not been administered when of course they have little value), by the degree of muscular relaxation, and by the color which may be noted from the lips and face but better from the color of the blood in the wound. The character of the respiration is of less value, as the patient may have excellent color though breathing very infrequently. Short, shallow, jerky respiration, especially when associated with a dusky color, is a danger sign, as in the pulmonary method.

I rarely take the pulse except in cases which are manifestly doing badly or where cardiac complications are known or suspected. Muscular tone is best determined from the tension of the jaw muscles and from the presence of voluntary movement of the tongue. It is the author's habit in using this method to keep one finger in the patient's mouth to detect the first active tightening of the jaw or voluntary movement of the tongue. Sufficient ether need not be given to make the lower jaw entirely relax but merely enough to prevent actual biting of the finger. Difficulty in breathing is readily overcome by extending the head on the neck by simply pulling with the finger upon the upper incisors. This has always been sufficient, so that in the entire series of cases here reported neither mouth-gag or tongue forceps have been used to improve the respiration of the patient.

At the end of the operation, the bowel is filled with oxygen to a pressure of 20 mm. and emptied several times, these "oxygen enemata" serving to carry off the greater part of the unabsorbed ether. Occasionally it seems advisable to massage the abdomen in the direction of the colon before removing the rectal tube, but this is usually unnecessary. The rectal tube is then withdrawn and disconnected from the Y-tube.

After Treatment.—As soon as the patient is returned to bed a high soap-suds enema is given, being siphoned off after a few minutes if necessary. A half hour later a second treatment of the same sort is given. Recovery is rapid and vomiting usually absent. When present it is very rarely severe and not a few of those patients who do vomit curiously enough disclaim any feeling of nausea.

To prevent any possibility of transmission of typhoid, amœbic colitis or other intestinal infection from one patient to another, the rectal tube and the Y-tube are kept between cases in a 1 per cent. solution of formalin. The glass tip of the accessory mouth tube is kept when not in use in the same solution.

CONCLUSIONS.

From what has preceded, it is evident that the colonic method of administration of ether is more complex than the pulmonary method in general and requires from the anæsthetist a broader appreciation of the physiological factors involved. For these reasons alone its field of usefulness is limited to cases in which it presents distinct advantage over the pulmonary method. It is therefore not a method adapted to the experimental use of the tyro but rather a valuable addition to the armamentarium of the trained anæsthetist.

We may summarize the indications and contraindications as follows:

Indications.—(1) Operations upon or about the respiratory tract (head, neck and chest) especially such as lay open the mouth, larynx, pharynx and trachea.

2. Operations upon patients in whom ether absorption must be minimized on account of lung, heart or kidney lesions.

3. Operations upon cases already suffering from respiratory embarrassment.

Contraindications.—(1) Operations upon cases presenting lesions of the alimentary tract, especially such as might cause weakness of the wall of the colon.

2. Laparotomies in general, except such as do not open the general peritoneal cavity, *e.g.*, suprapubic cystotomy. This because of the interference of the inflated colon with the work of the surgeon.

3. Operating upon cases with markedly incompetent sphincter or with large complete fistula in ano. A patient with an open appendicostomy would offer the same difficulty of leakage.

4. Operations upon cases suffering with orthopnoea. In these cases it is usually impossible to inflate the colon because of the obstruction caused by the weight of the other viscera resting upon it.

5. In emergency cases in general because of the lack of preparation of the colon.

The points in favor of the method in cases in which its use is indicated may be summed up as follows:

1. Freedom of operative field from contamination by the anæsthetist.

2. Ability to maintain a smooth and continuous anæsthesia in operations involving the respiratory tract, thus shortening the time and reducing the shock of operation.

3. Uniform depth of anæsthesia, causing light narcosis and a marked saving in ether.

4. Lessening of pharyngeal and bronchial secretion and of tonic contraction or troublesome relaxation of jaw muscles.

5. Ability to administer oxygen without interruption of anæsthesia.

6. Minimized loss of heat during operation because of diminished sweating and ether refrigeration.

7. Reduction of postoperative vomiting and nausea.

The only point against the method in cases where its employment is indicated is the occasional difficulty in maintaining profound anæsthesia without the use of the supplementary mouth tube.

In justice to myself, I am forced to disclaim responsibility for the premature appearance of some of the figures herewith given and of a partial description of my apparatus which appeared in a recent article on the subject of rectal anæsthesia.⁴ The photographs and letters which formed the basis of the article in question were furnished the author solely to assist him in his use of the method and their publication was without my knowledge or consent.

It is a pleasure to acknowledge my indebtedness to Drs. Jos. A. Blake and Geo. E. Brewer, on whose services in Roosevelt Hospital this work was done, for their hearty encouragement and assistance.

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PUS IN THE ABDOMINAL CAVITY.*

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THE last three decades have cleared up the rôle of bacteria in pus production, and pathologic physiology has taught us much concerning its meaning. Surgery has turned a flood of light upon the avenues of intraperitoneal infection, and, armed with a knowledge of its principles, has been making an increasingly successful fight against it. Still, infection and its sequel, pus formation within the abdominal cavity, constitutes one of the chief dangers to life and consequently one of the chief problems of surgery.

Pus in the abdominal cavity may be either free or circumscribed. That it may become confined is due to the adhesive powers of inflamed peritoneal surfaces. In general, circumscribed collections of pus are less dangerous to life than an unconfined suppurative process. Collections in the lower part of the abdomen are less serious than those in the upper portion. Abscesses situated at the margins of the cavity afford a better prognosis than those located centrally, and those which abut upon the wall through which discharge may be effected, than those which lie between loops of bowel, folds of mesentery, or in recesses behind the viscera.

Wherever it be, however, a definite collection of pus within the abdomen requires surgical aid, except in the rarest instances. "Ubi pus ibi evacuatio" is as true to-day as it was when it was coined in the days before the pathogenesis of pus was understood. The practical problems, therefore, resolve themselves into two, namely, the time of attack, and the method of approach.

The chief sites of circumscribed pus are: in the lower

* Read before the Philadelphia Academy of Surgery, December 6, 1909.

abdomen, the right iliac fossa and the pelvis; in the upper abdomen, between the diaphragm and the subjacent viscera, below the right lobe of the liver, in the so-called subhepatic space, and in the peripyloric region, both anteriorly, in the general peritoneal cavity and posteriorly, in the lesser sac. These sites correspond in general to the great sources of intra-peritoneal infection, the appendix, the internal genitalia of the female, the gall-bladder, and the pyloric region of the alimentary tract. Usually, therefore, the location of an abscess points to its origin.

There is, however, considerable variability from the type of abscess derived from each of these sources; secondary collections may form elsewhere, and less frequent conditions, such as diverticulitis, perforation of benign or malignant ulcers of the intestine, suppurating mesenteric glands, acute pancreatitis, and a host of other conditions may on occasion give rise to abscess formation, so that no region of the abdomen is entirely immune.

An appendiceal abscess should be attacked as soon as its presence is determined, providing the patient's condition warrants any operative risk. The form which is most amenable to treatment is that which lies external to the cæcum in the flank. A simple incision into the abscess will evacuate the pus and provide free drainage. The cavity should not be irrigated, nor should the wall be roughly wiped free of pus. Nature has already thrown about the cavity a protective wall of embryonic connective tissue which will do its own work of cleansing, and will secrete antibacterial serum for the extermination of the micro-organisms, while granulation will start at once when pressure is relieved. Let the delicate granulations alone. A cautious search for the appendix may be made, and if it be found in the wall of the abscess cavity it is proper to remove it. In my opinion it is inadvisable to insist upon finding the appendix, if, thereby, it is necessary to do extensive damage to the confining adhesions or to open the looser post-peritoneal tissues. Recurrence will occasionally happen when the appendix is not removed, but in my opinion the immediate indica-

tion is the urgent one,—and that indication assuredly is to get the patient well from his present attack, accepting no unnecessary chances. Nature has already excluded the appendix and it is no time to do preventive surgery in the presence of infection and toxæmia. Loose gauze packing is advantageous, not as drainage but to keep the cavity and incision open so that drainage may occur. Care should be taken not to obstruct the free drainage with tightly packed and sodden gauze, misnamed drainage. This is the course which has given me the best results, where the incision may be made through the parietes directly into the abscess.

Where the abscess does not abut in this manner upon the accessible abdominal wall, as in collections beneath the mesentery, between coils of intestine, below the liver, or retrocæcal, it is necessary to open freely into the abdominal cavity. Then, cautiously exploring the limits of the abscess, gauze pads should be packed about it to push the unaffected bowel away and to protect it from soiling. The abscess may then be opened and the pus aspirated or gently mopped away.

In such a case I make a special effort to locate and remove the source of infection. Nature had excluded it from the general cavity, but we have annulled her work and placed it once more in communication. We must therefore, if possible, provide against a recrudescence under conditions once more favorable to generalization. Having accomplished this much we must provide a tract for the discharge of necrotic and infectious material from the site of the abscess and the isolation of that tract from the general cavity. This we do by tubular drainage of rubber or glass, or other material, if the abscess cavity be distant from the surface where discharge is to take place, as in pelvic abscess or abscess located below the liver, or in the enteronic area. It may be advisable to bring such drains out through a stab in the loin or suprapubic portion. Isolation of the tract we effect by making use of the power of gauze to excite adhesions. Some soiling of clean peritoneal surface must occur in such manœuvres. But the peritoneum is no longer regarded as it once was, as the most

vulnerable structure of the body. It is the good friend of both surgeon and patient, and with the aid of the immune forces of the body already rallied against the infection, it can take care of itself, providing the original focus is not able to direct an attack against it. We do not presume, however, on this defensive power of the peritoneum, but aim to soil as little clean surface as possible.

Like loin abscesses, collections of pus in the pelvis, may at times be advantageously opened extraperitoneally by way of the vagina. These abscesses arise usually from tubal disease. When acute or subacute if we have reason to believe that the pus contained is still infective, this is a safer procedure than to attack the collection from above. This is distinctly a palliative operation and will usually require abdominal section at a later date. Therefore, when the process is of considerable duration and we have reason to believe that the pus is sterile or of low virulence, it is best to make a laparotomy in order to attend at the same time to such organs as are diseased beyond hope of repair.

Subdiaphragmatic abscess affords special difficulties both of recognition and treatment. In view of Dr. Jopson's more extended paper upon this subject to-night it is unnecessary for me to do more than mention it.

Abscesses in the pyloric region, if in the greater sac, must be attacked anteriorly and our drainage arranged so as to give the most efficient and direct outlet, at the same time disturbing normal relations as little as possible. In the disposal of all drainage we must give consideration to the position of the intestines, avoiding such tortuous paths as will conduce to kinks and secondary obstruction. We should also, whenever possible, make use of the force of gravity to carry off the secretions,—in other words, secure dependent drainage. This is often impossible, and we must be content with relieving tension and providing a free outlet, by far the most important indications.

Owing to the difficulty of localization before incision, it will sometimes happen that after opening the abdomen we will find our collection within the lesser sac. In such cases it is

usually wise to close the anterior wound and make our avenue of discharge through the flank. This holds true also for peripancreatic suppuration due to suppurative or gangrenous pancreatitis.

In these cases the pus is really post-peritoneal, though it may simulate, by its forward bulging, an intraperitoneal tumor or abscess. I have several times encountered the condition, and have had no cause to regret my choice of posterior drainage, though it involved another incision. In one remarkable case, about a year ago, the entire body and tail of the pancreas, completely gangrenous, was spontaneously discharged twelve days after operation, and the patient made a good recovery.

By slight appropriate variations of these principles any abscess in the abdominal cavity may be attacked with good hope of success. In certain cases one will find more or less reparative surgery indicated. A perforating ulcer must be closed, or perchance resected. Malignant masses may require removal. These possibilities are too numerous to be foretold or here discussed. The largest measure of interest attaches to those cases in which the pus is not confined, but exists free within the abdominal cavity. At the outset of infection there is practically always some free pus formation in the immediate vicinity. This is a defensive process of Nature. To fulfil its purpose in an ideal manner, it must speedily accomplish the destruction of invading micro-organisms and again undergo absorption. This frequently occurs. How often we are met with a thin turbid fluid, seropus, when we open the peritoneum in search of an inflammatory condition! A culture may, or may not, be positive for micro-organisms. If not, it was formerly explained on the grounds of a chemical peritonitis, but we now know that failure to find organisms indicates that they have been destroyed, absorbed, or entangled in the fibrinous mesh upon the surface of the intestines.

If the infecting organisms be of high virulence, or in too great dosage, whether by sudden escape of large quantities of infective material or by reason of a slower but continuous outpouring of renewed infection, or if the bodily resistance

be inadequate, the defense is overpowered, exudation continues, the slain and useless phagocytes accumulate, the fluid-deprived of its antitoxic and antibacterial properties, becomes at once a culture medium for their multiplication and a means for their transference to fresh fields. The powerful toxic emanations of the bacteria held in solution in the liquor puris make it a poisonous foreign material, locally injurious and, by absorption, dangerous to the delicate parenchyma of the essential organs. Thus we are "hoist with our own petard."

Of all single factors which influence the outcome of such a case that of time is the most important. It is true that there are cases of infection of the peritoneum which at the present time seem to be uninfluenced by surgical treatment at any stage. These are usually due to the streptococcus and cause little pus formation but an intense inflammation and paralysis of the intestines with rapid fatal toxæmia. No known surgical measures seem to change materially the course of such an infection. Thus Barker in the last Address in Surgery before the British Medical Association was led to remark: "When we speak now of peritonitis we are conscious that we are using a term which includes conditions as widely apart as an ordinary attack of eczema and a desperate cutaneous, streptococcal erysipelas." In these cases I doubt whether the mechanical aids of surgery will ever be sufficient to avert a fatality, and I look for help rather to some method of inducing active or passive immunity to the micro-organism.

Fortunately these extreme cases are comparatively rare. The vast majority will yield promptly to operative treatment provided it be done sufficiently early. In my experience the prognosis of peritonitis depends not so much upon the type of infection as upon the duration of the disease before treatment is instituted. Late peritonitis is quite a different disease from early peritonitis. I may illustrate this from my own experience by a series of cases which I have had compiled recently. In 70 consecutive cases of diffuse peritonitis secondary to perforative or gangrenous appendicitis, or ruptured gastric or duodenal ulcer, which were operated upon within forty

hours after onset, there was but one death, a mortality of 1.4 per cent. Of 99 cases operated within the first fifty hours, three died, a mortality of 3 per cent. This gives an idea of the rapidity with which the mortality mounts as a result of delay in this class of cases. As a further illustration I may say that in the last consecutive 55 cases which I have found suffering with generalizing or generalized peritonitis, there have been 11 deaths, a mortality of 20 per cent. A number of these cases were in extremis when admitted, and I confess that I know of no way to save the neglected cases. I resent the fact that these deaths are charged to surgery when the blame really rests upon the cause of delay, whether that be due to circumstances, to the patient himself or, as in too many instances, to bad advice.

While we are busied with improvements in technic, therefore, let us not forget to sound the note against delay, the most important single cause of mortality.

As a corollary to the importance of early operation is the fact that the most important single object of operative intervention is the treatment of the focus of infection itself. Appropriate treatment of this source will often be sufficient in itself to allow nature to complete the cure. There are, however, many subordinate aids in treatment which are of great value, among which I would mention the importance of quiet, the Fowler position, light careful anæsthesia, quick, skilful operation, saline infusion hypodermically, intravenously and particularly by way of the rectum as introduced by Murphy, and careful after treatment, usually consisting in a "masterly inactivity." The scope of this paper, however, precludes more than passing mention of all these and necessitates close adherence to the subject.

What is to be our attitude towards the pus already present within the abdominal cavity? It is but a few years since the peritoneum was considered one of the most vulnerable tissues of the body. Surgeons were horrified at the discovery of pus within the abdomen, and with little faith in nature they devised methods of treatment consonant with their belief that

the recovery of the patient was possible only through their ingenuity in getting rid of the pus. So we find that patients had their bellies washed out with antiseptic solutions, the intestines vigorously scrubbed with gauze, and some surgeons, more ingenious than clear sighted, devised means for constant irrigation of the abdominal cavity. These measures were supplemented by cumbrous methods of drainage both with gauze and tubes. These attempts at plumbing not only failed signally to perform the function for which they were devised, but gave rise to complications due to their presence. On the other hand it was observed that the peritoneum of itself possessed wonderful resisting and recuperative powers. More and more was entrusted to nature and even to-day we have not found the limit. I am certain that I drain less and less every year. Where I once said, "When in doubt, drain," I am now likely to say, "When in doubt, don't drain." I do not hesitate to close up any case which shows only a small amount of seropurulent fluid within the abdomen. Often the culture from such an exudate will be sterile, indicating that the infection is already overpowered. But even when micro-organisms are demonstrated it makes no apparent difference in the ease of recovery.

Thick, vicious-looking pus in considerable amount, especially if it be foul smelling, is in my mind still an indication for drainage. I waver somewhat even in certain of these cases, and I have closed a few of them without ill effect. I believe that we will find it unnecessary to drain many of these cases if the source of infection can be rendered innocuous. I believe this to be true both because of the clinical evidence of having seen such cases get well without drainage and because I am skeptical of the degree of general drainage of the abdominal cavity that may be obtained by practical methods. I have pointed out that the earlier attempts at extensive sewage systems resulted in failure. Now when we limit the amount of drainage we get hardly more than a local effect. It is a fatuous hope to drain the abdominal cavity by introducing a tube into the pelvis, or indeed into any other region of the

abdomen. In my opinion we are still much misled by the idea of drainage as applied to the abdominal cavity. Any foreign body within the peritoneum speedily excites adhesions which cut it off from the general cavity. Especially is this true when the peritoneal surfaces are already inflamed. The function of any sort of drainage placed among the intestines rapidly becomes purely local. For a few hours it may serve to a limited extent as a general avenue of discharge, but this soon ceases and the discharge becomes usually thin and watery, being nothing more than an exudation from the walls of the drainage tract. I have not infrequently seen such drainage from a tube when there was a large amount of unconfined pus in other areas of the abdomen. This fact also has a bearing upon the ideas in regard to the relief of tension, almost a cant phrase nowadays. In desperate cases it is not so uncommon to find a high degree of tension with accumulation of pus in spite of tubes introduced within the abdomen. Thus, when the surgeon is cajoling himself with such ideas of scientific assistance he may be doing very little to affect the result. These facts confirm me in my belief in little drainage, skillfully placed and quickly removed, as its effect becomes local rather than general.

Another misleading term is drainage as applied to gauze, the true use of which is to isolate necrotic areas or dangerous foci of infection from the general cavity and establish a tract opening upon the outer world. When used as drainage it more often defeats its purpose than it accomplishes it. Sodden, pus-soaked gauze is an obstacle to the flow of secretion instead of a conductor. As I remarked long ago, a cigarette drain is an excellent thing when there is nothing to drain.

In the treatment of free pus within the abdominal cavity, then, we are obliged to rely very largely upon the powers of the peritoneum to care for itself. We may aid by the evacuation of an excess of pus at the time of operation, and by means of drainage we may secure a sustained effect for some hours. This is undoubtedly very important for many cases and should be done, but in many others it is not essential, and in those

which are benefited we often aid nature but little in the disposal of pus and infection already present.

The advisability of washing away the exudate at the time of operation is, of course, another point to be considered here.

I am aware that free general irrigation, local irrigation, wet sponging, dry sponging, and no irrigation, all have their strong adherents well fortified with opinions and statistics. I feel, however, that any strenuous measures directed towards removal of exudate already present are but an expression of the old tendency to do too much and rely too little on nature. While Blake and some others have reported excellent statistics obtained under the irrigation treatment I am convinced in looking over the statistics reported by many workers that those who do not irrigate get the best results. I have been better satisfied since I abandoned it some years ago. My objections to irrigation in brief are that:

1. It consumes time that we cannot afford to lose.
2. It diffuses infectious material, a serious matter in generalizing peritonitis where there may be extensive areas of peritoneum as yet unaffected.
3. By causing us to manipulate the bowels it has a tendency to promote paresis.
4. My own experience, and I believe the combined experience of operators all over the world, show a higher percentage of cures without irrigation.

I do believe it to be good practice to aspirate any collection of fluid in the pelvis, or elsewhere, that is accessible, or to absorb gently with gauze any highly foul or purulent exudates about the source of infection, but to wash extensively or to go on any extended tour of the abdomen seeking for exudate to clear away, I believe is wrong.

One other suggestion. I have observed in certain desperate cases with large amounts of vicious pus in the cavity that a long incision partially approximated and overlain with gauze to retain the intestines permits a marked escape of exudate and seems to relieve abdominal tension in a far more satisfactory way than a single tube or multiple tubes brought out through an angle of the incision.

THE TREATMENT OF DIFFUSE PROGRESSIVE FREE PERITONITIS.

A STUDY OF SIX HUNDRED AND NINE CASES.

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It is well known that in the vast majority of cases peritonitis is due to inflammatory processes of the appendix vermiformis. During the past nine years and six months,—that is, within the period beginning May 1, 1899, and ending December 1, 1908,—six hundred and nine (609) cases of free progressive peritonitis were admitted to the two surgical divisions of Mount Sinai Hospital. Of these, four hundred and sixty-one (461) were caused by appendicitis, while only one hundred and forty-eight (148) were due to injuries and affections of other viscera. Thus we see that peritonitis followed the affections of the appendix more than three times oftener than all other causes.

For the study of the relative value of the various methods of surgical treatment employed in peritonitis, the form caused by appendicitis offers the most favorable conditions. There is in appendicular peritonitis, both as regards the locality and the sequence of the phases of the morbid process, a greater uniformity than in any of the other forms of the disorder. Premonitory symptoms of peritonitis are usually present for some time and are easily recognized in the manifestations of appendicitis. The field of the onset of the trouble,—usually the right iliac fossa,—is by laparotomy very accessible to inspection, and to the surgeon both the causation and the degree of the process are early ascertainable. Hence, for the study of peritonitis no region is more suitable than the right iliac fossa.

Within the period mentioned above, there were observed

in the first and second surgical* divisions of Mount Sinai Hospital, New York City, altogether three thousand, one hundred and forty-four (3144) cases of appendicitis. Of these, more than one-half,—that is, one thousand, eight hundred and sixty-six (1886) cases were complicated by various forms of intraperitoneal suppuration. Of these again, a little more than one-quarter,—that is, four hundred and sixty-one (461),—presented the features of a progressive free peritonitis. By comparing the sum of all the cases of appendicitis with the sum of those of free progressive peritonitis, we find the proportion of the latter very high, that is, we encounter this dangerous condition about seventeen times in one hundred cases of appendicitis.

Diagnosis.—Before entering upon a further analysis of the figures just presented, it is necessary to define as precisely as possible our meaning of the term "*progressive free peritonitis*." In examining the literature of the subject, we find a remarkable divergence in the estimation of the morbid value or dignity of the term "peritonitis." This shows itself in the statistical results reported. Some authors have lost an appalling number of their patients, others have saved an astonishingly large proportion. The question seems to be pertinent: *Is not this difference due to a divergence in the conception of the value of the term?*

The subject of defining and classifying the various forms of peritonitis, and their significance, is surrounded by great difficulty. Naturally, the preponderant factors in diagnosis

* Each of the two surgical divisions of Mount Sinai Hospital contains about 65 beds. In the division (2d) of Dr. Howard Lilienthal, who kindly placed his material at my disposal for the purposes of this paper, the operative work was done by himself and by two adjunct surgeons, Drs. Charles A. Elsberg and Joseph Wiener; in the author's division (1st), the operations were done by Dr. Gerster, and by Drs. A. V. Moschcowitz and A. A. Berg, adjunct surgeons. As to the improvement of our results, much credit is due to the adjunct surgeons who, by the great promptness with which newly admitted cases were attended to at all hours of the day, but especially in the night time, were undoubtedly instrumental in saving an increasing number of lives, that would certainly have been lost under a procrastinating management.

and classification have been anatomical. But each of the anatomical factors, taken by itself, is inadequate to give a true conception of the dignity of the process in question. Recognition of the bacterial element of causation has widened and deepened our comprehension; but a too one-sided reliance upon its value is also apt to lead to error. Finally, we have begun to search into the physiological side of the matter, by studying the ways in which the unaided organism tries, and often succeeds, in eliminating dangers due to infection. The vague term, "the powers of resistance of the individual," is beginning to take shape, and the comprehension of its full meaning will greatly aid us in understanding the divergent issues of a seemingly identical process.

It is not necessary, before this assembly of distinguished surgeons, to enter into the demonstration of the fact that not one of the clinical, nor any one of the anatomical or bacteriological factors, *alone*, can give us a true and valid conception of the morbid dignity of a given case of peritonitis. Those who have opportunity to see many of these cases, know the protean forms under which peritonitis presents itself to the clinician. One or more of the clinical symptoms of the disease may be absent for a long time, and reliance upon the gross anatomical elements, such as injection of the serosa, distention of the gut, fibrinous deposits, the quantity of the effusion,—its clearness, turbidity, or purulency,—the presence or absence of adhesions, are each and all of no fixed value. *The amount of danger to the life of the patient, and this alone, constitutes the salient point of the matter.*

As none of the single factors that compose a given case of peritonitis has a constant and absolute value, the accuracy of any form of classification based on one or other of them must necessarily be faulty. Its value is not absolute, is only relative, approximative,—hence, must be accepted with caution and reserve. The estimation of the prognostic significance of the symptoms of a case of peritonitis must be based not only on ascertainable facts, but on the general impression that the sick individual conveys to the observer. This again

brings into play the personal equation of the diagnostician; not only his technical skill in diagnosis, but that acuity of perception,—the *art*, in short,—which is not convertible into precise terms. If we now consider temporary or permanent bias caused by disposition or indisposition, added to the shifting and insecure basis of premises of fluctuant value, we shall on the one hand comprehend the pessimistic extreme of Senn, who would not admit the term of diffuse or, as the term then went, of general peritonitis, unless the diagnosis was sealed by death; on the other hand, we shall learn to accept "*cum grano salis*" the glibness of the sanguine surgeon, who unhesitatingly dubs every case of free peritonitis as diffuse and spreading, registering after his operations a remarkable quota of cures. Yet, to be just, it cannot be denied that, at a certain early stage of its development, almost every perforative peritonitis is free and progressive.

But admitting that the single criteria of the significance of a case of peritonitis are all of relative value only, we must nevertheless recognize that, in determining danger to life, some of these possess more weight than others. First among them is the quantity of infectious material that is pouring out into the healthy peritoneal sac, either at one single time or continuously and without interruption. A pinhole perforation, for instance, has a different meaning from a large defect caused by gangrene, wherefrom, during an access of diarrhœa, there issues a continuous stream of liquid, highly virulent fæces. Of equal perniciousness are the sequelæ of the rupture of adhesions that have confined a large intra-peritoneal abscess. The infection here is not single and sparse, but is continuous and, as to quantity, copious.

Another factor of great importance, the early determination of which should spur the surgeon to immediate interference, is a high rate of leucocytosis. But as the most significant index of the virulence of the infection may be accepted the result of the differential count. Intense virulence is indicated by the increase of the relative number of polynuclear cells, which may be present with a moderate degree of leucocy-

toxis. (Sondern, *Am. Journ. of Medical Sciences*, 1906, p. 889; and Albrecht, *Zeitschr. für Geb. und Gynaec.*, 1907, Bd. 61, Heft 1.)

Bacterial activity and virulence being at their greatest height in the appendicular region of the intestine, infections from there demand the promptest attention. Of the various bacterial forms concerned in producing peritonitis, we have first to mention the bacterium coli, on account of both its frequency and virulence. In a total of 171 cases we have found it 116 times alone, and 19 times mixed with other forms of bacteria,—altogether 135 times out of a total of 171 cases. Next in frequency, though not inferior in virulence, was the streptococcus, found unmixed in 14 cases, and combined with other bacteria 21 times,—altogether about 35 times in 171 cases. The appended table, taken from A. V. Moschcowitz's meritorious paper,* will aid in the estimation of the frequency of the various forms of bacteria.

	Cases.	Recovered.	Died.
Bacterium coli	116	89	27
Bacterium coli and streptococcus...	14	10	4
Streptococcus	13	9	4
Friedlander's bacillus	4	4	0
Pneumococcus	3	3	0
Staphylococcus alb.	3	2	1
Streptococcus and staphylococcus alb.	4	2	2
Proteus vulgar	4	2	2
Proteus and bacillus coli.....	2	1	1
Bac. coli and unknown bac.....	2	1	1
Bacillus pyocyaneus	2	1	1
Bac. coli, pyocyaneus, staphylococci and streptococci	2	1	1
Bac. coli and staphylococcus aureus..	1	1	0
Streptococci and Friedlander.....	1	1	0
	<hr/> 171	<hr/> 127	<hr/> 44

The third factor of greatest importance is the time elapsed since the perforation. At last year's (1908) meeting of the American Surgical Association, John B. Murphy of Chicago

* Zur Appendicitisfrage. Ein Bericht über 2000 consecutive Fälle, etc. *Archiv. f. klin. Chir.* Bd. 82, p. 683.

presented an admirable paper on our subject, in which he published the records of 49 cases of spreading, free perforative peritonitis, mostly appendicular (42), in none of which had more than 40 hours elapsed since the moment of perforation. In the majority of these cases the operation followed perforation within twenty-two to thirty hours. Two only of the patients died, a most remarkable showing.

Heartily approving of the attitude of Murphy in laying the greatest stress on early operating, we may yet pertinently raise the question: Were all of these cases really such that uninfluenced by an operation they would certainly have progressed to the death of the patient? Would not a number of them have ceased to spread and become, however large, circumscribed abscesses? Whatever the answer to this question may be, the fact stands unimpeached, that surgical measures, such as were employed by Murphy, were followed by the recovery of 47 patients out of 49,—to the early interference undoubtedly belonging the principal share of the success.

On the question of time hinges to the greatest degree the condition of the patient. The longer the time that has elapsed since perforation, the larger becomes the area involved and the deeper the state of general intoxication. On these conditions again depends the state that determines paralytic ileus, interference with the heart's action and its ultimate exhaustion, foreshadowed by cutaneous cyanosis, a rapid thready pulse and clammy integument. Happy the surgeon whose experience in perforative peritonitis is limited to cases of not more than 40 hours' duration! In the wards of Mount Sinai Hospital these cases were rare exceptions,—the majority of them being of three, four, seven days, and even of longer duration.

To be classed as open, diffuse, progressive peritonitis, each case had to present all, or the majority of the following clinical characteristics:

Beside a marked gravity of the combined impression made by the symptoms at an early stage—

- I. Sunken features, anxious expression.

2. High rate of pulse and respiration.
3. Pronounced distention.
4. General rigidity of abdominal muscles, flexed thighs.
5. General abdominal pain.
6. General tenderness, including the pelvic peritoneum on vaginal or rectal touch.
7. Constipation, often preceded by diarrhœa.
8. Frequent projectile vomiting.
- 9 The presence of a free movable fluid in the peritoneal cavity, proven by percussion.

It need hardly be said that there exists unending variety in the prominence of one or the other symptom, or of groups of symptoms.

On the operating table, the peritoneum being incised, large quantities of turbid, sero-purulent or frankly purulent exudate must be seen escaping under considerable pressure from all the accessible parts of the cavity. The insertion of the hand or a glass tube into the flanks and pelvis should cause the escape of free exudate. Though this test was regularly made, its value, for obvious reasons, was not considered absolute. In very far-gone cases, the delays caused by it forbade its application. But even where it was admissible, its value had to remain relative, as we know that,—especially in late cases,—enormous exudates may exist that have the semblance only of being diffuse. In reality, they are circumscribed and limited by a wide rampart of adhesions. In classifying a given case of peritonitis, this circumstance may be the most fruitful source of error, leading, according to the bias of the surgeon, either to under-estimation or to exaggeration. The corrective must be sought in the general features, the principal criterion remaining the apparent danger to the patient's life. *The ascertainment of the degree of diffuseness is, and will remain, the weak link in the diagnostic chain.* Recognition of this fact should admonish to caution and modesty. In the later stages of the malady, the presence of a circumscribed abscess occupying remote portions of the peritoneum, is strong evidence of the wide diffusion of the original

process. These secondary foci represent residual abscesses.

None of our recent cases of perforative or non-perforative appendicitis in which a free, unconfined, sero-purulent exudate was found to occupy the immediate vicinity of the damaged appendix, involving only the right iliac region or the pelvis, were included in this series.

Besides the free, unconfined exudate, we generally have found a deeply congested visceral and parietal peritoneum, invested here and there at the line of contact of adjacent coils of intestines by fibrinous deposits; or we found merely its lustre gone. The intestine was much distended, its retention in the peritoneal cavity demanding special measures.

The observation that in the presence of a frankly purulent and free exudate the lustre of the peritoneum may be found intact, is explained by the absence of the more virulent forms of bacteria such as the bacterium coli, or the streptococcus, or the pyocyaneus, and by the abundant presence of the staphylococcus albus,* which is a powerful agent for stimulating phagocytosis. In these cases the original agents of infection have evidently disappeared.

As mentioned above, we have, in addition to the 461 cases of appendicular free progressive peritonitis, to report another group of one hundred and forty-eight (148) cases, in which the infection of the peritoneum was due to contamination from other viscera than the appendix. It was deemed proper to segregate these cases from the former, for the reason that in most of them the conditions causing perforation were in themselves of the gravest,—in many cases of a fatal,—character. Such were, *e. g.*, cancers of the stomach and intestine that caused perforation, volvulus and hernia with extensive gangrene. Of these 148 patients, twelve (12) were not operated upon, death being imminent. They were excluded from the calculation of the therapeutic results.

Indications.—Except where death was imminent, our rule was to operate in every case as soon as possible. Reviewing the phases through which our indications and treatment of

* Dudgeon and Sargent: Bacteriology of Peritonitis. 1905.

free progressive peritonitis have passed within the last ten years, we find that in the first two or three years of the period under consideration we invariably operated as soon as we could. The mortality was very great. This must be attributed partly to the circumstance that most of the patients had been ill with peritonitis for more than 48 hours, and that the operative measures employed were too incisive, consisting in multiple incisions, more or less complete eventration, sponging, irrigation, and a complicated system of drainage by tubing and packings. Under this regime, our mortality in 1899 reached 79 per cent.,—that is, 30 died out of a total of 38 patients. We then modified the treatment inasmuch that in very far-gone cases the stomach was emptied by lavage, the rest of the treatment consisting in the administration of opiates and nutrition by rectum. We then observed that in a respectable percentage of the cases the patients, seemingly doomed by the extent, and presenting all the classical symptoms of the malady, did not die. After a certain number of hours of extreme peril, flatus began to pass, the distention diminished, vomiting stopped, and the facial expression became distinctly improved. Physical examination revealed that the signs of a free exudate having disappeared, their place was taken by those of one or more circumscribed intraperitoneal abscesses. These being incised and drained, the patients almost regularly recovered. We were inclined to assume that the lives of these far-gone patients were saved by our abstention to operate. But in this assumption there was this error: that the saving clause of our abstention lay not in the bare fact of not operating, but rather in our eschewing the heroic and exhausting measures previously in vogue. The truth of this became evident when, milder methods being followed and our rate of success increasing, we began to extend again the range of our indications for immediately operating on the severer and severest cases. The experience of the last five years shows that immediate operation is preferable to procrastination, provided that the measures employed do not involve too great a draft on the patient's power of endurance.

Unhesitatingly, it may be asserted that in the vast majority of cases procrastination is more dangerous than operation. Hence, the rule was followed by us: never to delay operation on a newly admitted case of peritonitis longer than was demanded by the necessary preparations. This rule was applied also to all cases of circumscribed intraperitoneal abscesses of appendicular origin. The reason therefor was the observation that one of the most dangerous forms of peritonitis was caused by the rupture of those abscesses. It may be occasioned by vomiting, or by pressing at stool, or even by the exertion necessary to turn in bed. As the amount of hydrostatic pressure, to which the adhesions limiting such an abscess are subject, is an unknown quantity, it is our duty immediately to incise and evacuate. A rupture occurring, the sudden escape and continued outpour of large quantities of pus is one of the greatest dangers to which life can be exposed. Special measures were taken, therefore, at our hospital, to organize the service in such a manner that patients admitted with peritonitis, or with intraperitoneal abscesses, were operated upon within not more than an hour after their reception.

Therapy.—To appreciate the influence of the treatment upon the final issue of our 461 cases of free progressive peritonitis of appendicular origin, it will be useful to present the tabulated items in ten annual groups:

Year.	Totals.	Cured.	Died.	Percentage of mortality.
1899	38	8	30	79.0
1900	45	21	24	53.3
1901	32	21	11	34.3
1902	29	17	12	41.4
1903	40	28	12	30.0
1904	38	27	11	29.0
1905	45	32	13	28.8
1906	68	56	12	17.6
1907	64	55	9	14.5
1908	62	53	9	14.0
	<hr/> 461	<hr/> 318	<hr/> 143	<hr/> 31.0

MORTALITY OF PERITONITIS 1899-1908

1899		79% 38 Cases
1900		53.3% 45 Cases
1901		34.3% 32 Cases
1902		41.4% 29 Cases
1903		30% 40 Cases
1904		29% 38 Cases
1905		28.8% 45 Cases
1906		17.6% 68 Cases
1907		14.5% 54 Cases
1908		14% 62 Cases
		TOTAL, 461 Cases. AVERAGE MORTALITY 31%

We see that, summing together all these cases, one out of three patients succumbed to the disease. But as the therapy, first very incisive, became materially modified in the last five years, it is proper to indicate the points which were changed.

Before we enter into the consideration of the details of our therapy, however, something must be said regarding the patients. They came, almost exclusively, from the over-

crowded tenements of the East Side. Though of sedentary occupations, they were well nourished, and being remarkably free from alcoholism, presented human material of a fair degree of resistance to illness. But their unwillingness to abandon their cramped quarters for the hospital, very frequently led to unwise procrastination, and was the principal cause of the fact, that in only a small fraction of the cases of perforative peritonitis admitted to Mount Sinai Hospital had perforation occurred within less than 48 hours. This circumstance has remained unchanged during the entire period covered by this report, therefore the remarkable improvement of therapeutic results must, in the main, be due to the changed character of the treatment.

By examining our table, we shall see that each annual group represents a respectable sum by itself, descending below thirty (30) once only,—the annual average being forty-six (46) cases. In 1899, out of a total of thirty-eight (38) cases, thirty (30),—that is, four (4) out of five (5),—patients have died. A gradual and almost steady fall of the percentage of mortality per annum is manifest; thus, in 1900, there died one (1) patient out of two (2); in 1901, about one (1) out of three (3). By grouping the figures of the first five years together, we find that one (1) out of two (2) patients succumbed; while during the last five years, only one (1) died out of five (5) patients. By segregating the cases that occurred during the last two years of the series,—that is, in 1907 and 1908,—we see that the percentage of mortality descended to 14.0 and 14.5 respectively, which means that we are now losing one (1) patient only out of seven (7) cases.

This showing, though good, is far from being as good as that made by John B. Murphy of Chicago, who out of forty-nine (49) patients succeeded in saving forty-seven (47). But if we consider that in his collection there was none in which the peritonitis had lasted longer than forty (40) hours,—one (1) had lasted only three (3) hours, twenty-two (22) to thirty (30) hours being the most common periods; and, on the other hand, that with us these early operations were

rather the exception than the rule, our statistics representing everything that was admitted to and treated at the hospital,—the showing is really not so bad as it may appear on the first blush. While it confirms the conclusions drawn from Dr. Murphy's report, that in peritonitis early diagnosis and early operation offer the best promise of increasing success, it also demonstrates that a rational treatment of the far-gone, neglected cases, formerly considered as hopeless, will succeed in saving a respectable and increasing proportion of patients.

The proportion of cases of peritonitis to those of appendicitis has been gradually diminishing from year to year. This is due to the fact that the general practitioner has learned to diagnose appendicitis more promptly. The absolute increase of cases of peritonitis during the last four years is accounted for by the increase of the number of available beds from seventy (70) to one hundred and thirty (130), consequent upon the enlargement of the surgical services in the new Hospital building.

COMPLICATIONS OF PERITONITIS.

	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	Total
Mechanical ileus	6	1	1		1	1	3	5	2	4	24
Pelvic abscess	1	2	5	2	3	2	2	4		4	25
Subphrenic abscess		1		1			1	3	1	3	10
Mesocœlic abscess		3	1		1		1			2	8
Pylephlebitis							1				1
Mesenteric thrombosis	1										1
Fecal fistula	1		1	1			2	1		2	8
Gangrene of cæcum		1		1							2
Femoral phlebitis				1			1		1		3
Pyelonephritis		1									1
Pneumonia			1	1	2						4
Scarlet fever					1						1
Suicide		1									1

In surveying the complications of peritonitis arranged in annual groups, we see that in 1899, out of a total of 38 cases, mechanical ileus occurred 6 times, the quota being 15.8 per cent. This high rate we attributed to the employment of massive and multiple gauze packings, left in situ for drainage.

Of all the complications, the most common was the formation of secondary abscesses,—pelvic, subphrenic, and meso-coeliac.* Their aggregate was 43, that is, they appeared in 9.3 per cent. of 411 cases. They are regarded by us as residual in character, representing the localized residue of what was originally a general peritoneal involvement.

The question: Did Fowler's position favor the development of pelvic abscess? must be answered in the negative. They were not more numerous during the second half of the period, when Fowler's position was systematically employed, than before. It is also interesting to see that subphrenic abscesses were more frequent since Fowler's position came in use, than before: out of ten instances of this complication, eight were observed since 1905.

Let us now cast a glance at the methods that were in vogue with us during the early years of the period under consideration, and also indicate the manner in which our present-day methods have developed. Our early efforts at the cure of diffuse peritonitis were dominated by the idea that we were dealing with a process, if not identical, at least analogous with phlegmon.† Extensive and multiple incisions,

* Thus I have designated abscesses which are not adjacent to the peritoneal parietes, but are situated between and are limited by adjacent coils of intestine. They sometimes form movable tumors, consisting of an aggregation of mutually adherent intestinal segments which enclose an abscess.

† Peritonitis, an infectious inflammatory process of the surface of the serosa, is distinct from phlegmon, which implies destruction of tissue. The necrosis which produces perforation of a hollow viscus, is generally a limited process of relatively small importance, excepting the circumstance that it opens the way for the escape of infectious material into the peritoneal cavity. But sometimes peritonitis is induced,—fortunately the cases are rare,—by the extension of a phlegmonous retroperitoneal process to the peritoneal surface. Monro of Boston has demonstrated the occurrence of retroperitoneal lymphangitis and phlegmon consequent upon appendicitis. Here, as well as in septic phlebitis of the roots of the mesenteric veins and the portal vein, peritonitis is the complication of a far more dangerous and deadly process than peritonitis itself. The most timely surgical attention paid to this form of peritonitis may succeed in checking the peritoneal infection, but will not save the patient's life. We have seen in these cases all the symptoms of peritonitis disappear,

the object of which was the exposure and evacuation of septic accumulation of sero-pus and of pus, were the order,—supplemented by vigorous mopping and irrigation. The object was pursued with the utmost thoroughness, and no hesitation was felt in carrying measures to the point of systematic eventration, the purpose of which was a merciless toilette of all the affected surfaces. Replacement of the distended intestines being very difficult, multiple enterostomies were employed to evacuate gas and liquid fæces. Another practice, now abandoned, was then almost universal. It consisted in the use not only of abundant tube drainage but also of massive packings of gauze introduced into the various recesses of the peritoneum. These were removed either shortly after the operation, causing prolapse of intestines, or,—left in a long time,—were, we thought sometimes, the cause of mechanical ileus. Thus were added to the exhaustion caused by the malady, the depressing effects of prolonged anæsthesia and of heroic surgery,—resulting in a frightful rate of mortality. If any patients survived, they did so not in consequence, but

the general sepsis however continuing unabated until the patient's death. Post-mortem evidence of a more or less extensive retrocolic phlegmon, or septic pylephlebitis was found. It seems to be proper to refer here to the classification of appendicitis still in vogue in many clinics. The terms *primary*, *intermediate* and *late* are meant. It is stated that operations done on primary and late cases yield good results, while those done on intermediate cases are accompanied by a high rate of mortality. It is concluded, that here *the operation* constitutes the factor of danger, hence in an intermediate case no operation is admissible *unless the danger is very great*. It seems to us, that this line of argument is inconsistent and fallacious. First of all, the classification itself is vague, arbitrary, and not based on pathological fact. The danger, undoubtedly present in many cases that drag on to and beyond the third, fourth and fifth day without either resolution or the formation of a local abscess, is not due to any operation that may be done, but depends entirely upon the gravity of the local,—phlegmonous or phlebitic,—or of the general peritoneal process. Our extensive experience has amply demonstrated, that the earliest operation will, after all, yield the best chances of recovery to the patient, because by it one factor of danger, the peritonitis, may be, and is often eliminated. Thus, even a retrocolic phlegmon may, by exposure and proper drainage become manageable. At any rate, whenever death follows, this issue will be due not to the operation, but to a morbid process which has progressed so far as to be beyond control and remedy.

rather in spite of our therapy. Thus an attitude of general discouragement became universal.

But relief was at hand. It came from the growing conviction that the surgical elimination of the *causes* of peritonitis was the true way to combat the disorder. Early we learned to recognize the conditions which produce peritonitis, and the earliest possible attack directed against appendicitis,—the most common causative factor of the malady,—became a measure which, against much opposition, has finally attained almost universal acceptance. The operative indications, first timidly defined and surrounded by arbitrary and senseless acutelæ, became more and more stringent. The rule not to operate before the third, fourth, or fifth day after the onset of the appendicitis, was gradually abandoned, and prompt operations, done at any stage of the disorder, began to reveal to us all the phases of the process. This complete insight into the pathology of the malady strengthened the rationality of curative measures, and immensely improved the effectiveness of therapy.

It also brought along with it another advantage. It enabled us to study *in vivo*, by ocular inspection, the earlier stages of peritonitis, which, being confined to the immediate vicinity of the appendix, were taken care of, as it were, by the comparatively simple measures directed against the causative trouble.

Thus it became more and more evident that in peritonitis the stoppage of the leak, together with simple drainage of the focus of infection,—and in the more diffuse forms, with additional drainage of the most dependent, that is the pelvic part, of the peritoneum, aided by Fowler's posture (causing gravitation of exudate into the pelvis),—would yield better results than the excessively exhausting methods of former days.

Regarding the importance of stopping the leakage of a perforated viscus, a radical difference must be made as to viscus itself. Perforation of the stomach, duodenum, and the rest of the small intestine, absolutely demands closure of

the leak; while in a perforation of the appendix or the gall bladder, such closure is of much less importance. The fact is that, as a rule, where the appendix has "in toto" become gangrenous, the gangrene even extending to parts of the cæcum, tamponade and local drainage have been found perfectly sufficient. We earnestly believe, however, that the pendulum has swung to the other extreme in the case of those surgeons who, laying great stress on a more or less thorough cleansing by irrigation of the peritoneal cavity, treat drainage as an evil, reducing it to an ineffective minimum,—as did Joseph A. Blake;* or abandoning it altogether, according to the example of Franz Torek.†

The principles that guide us in the treatment of free progressive peritonitis may be summed up under the following heads:

1. The most important preparation,—to be done if possible *before* induction of anæsthesia, if not, directly after tolerance has been attained,—is, where indicated by frequent vomiting due to paralytic ileus, lavage of the stomach. Under proper indications, while the field of operation is being prepared, the heart action is stimulated by saline intravenous infusion and by hypodermatic injection of alcohol, or of camphor and ether.

2. The anæsthetic generally employed is nitrous oxide gas, followed by ether administered by the drop method.

3. The first object to be attained is always the exposure of the primary focus of infection. In the absence of a reliable indication as to the viscus from which the infection comes, a Kammerer incision is preferably done on the right side. The reason for this is the knowledge that in the majority of cases peritonitis is caused by affections of the appendix and, next in frequency, of the gall bladder. The incision should be adequate,—that is, neither too large nor too small. Rapidity of action being paramount, a minute incision may delay work by the difficulty of finding the nidus of the trouble; or,

* Am. Journal of Medical Sciences, vol. 133, p. 454.

† Medical Record, 1906, vol. 70, p. 849.

on the other hand, too large an incision will prolong the operation by demanding more sutures. Eversion should always be prevented by suitable measures.

4. The leak in the viscus, especially if it concern the stomach, duodenum, and small intestine, should be stopped by suture. In appendicular cases, the diseased appendix should be removed and the lumen closed by simple ligature. If the tissues are brittle or gangrenous, the site of the trouble should be packed with iodoform gauze.

5. The utmost weight is placed on husbanding the patient's strength by gentleness and rapidity of procedure.

6. The escape of the exudate from the iliac fossa, the pelvis, and flanks, is favored by the gentle insertion of a rubber gloved finger or hand. No irrigation is employed.

7. The right iliac fossa, and if necessary the cul de sac of Douglass, are drained by the placing of a stout but soft rubber tube, fenestrated at the distal end and containing a loose wick of iodoform gauze. The gauze wick favors the escape of enormous quantities of serum during the first 48 hours after the operation. To absorb all that is brought up by the gauze wick, the external dry dressings are frequently changed. As soon as the capillary drainage begins to lag, the wick is withdrawn, the tube remaining in situ. To prevent inspissation and retention, moist dressings replace the dry ones at this time. The objections raised by various surgeons against the use of rubber drainage tubes have not been sustained by our experience. We have never seen any complications that could with certainty be ascribed to their use. If the discharges remain serous, the rubber tube should be withdrawn on the third or fourth day. If not, the tube is the very thing to permit the escape of pus. As mentioned before, since the abandonment of massive gauze packings in 1899, mechanical ileus has occurred less frequently. (Exception in 1906 is seeming only.)

8. The wound is closed by three layers of superimposed sutures, one uniting the peritoneum, the second (chromic catgut) the sheath of the rectus muscle, the third the skin.

Usually the drainage tube is allowed to project from the lower angle of the wound.

9. Paralytic ileus continuing, lavage of the stomach is done as often as needed. Very rarely is enterostomy required, to evacuate gas and liquid feces from the small intestine. When necessary, a distended coil is withdrawn, and an extraperitoneal stab is made.* The aperture is immediately closed by one or two Lembert stitches. Peristalsis of the large intestine is induced by low enemata; if these fail, by a high enema; and if this also fails, by repeated rectal lavage.

10. Opiates are administered hypodermatically whenever required. We do not share Lawson Tait's prejudice against the use of morphine, and consider its withholding cruel and harmful. After the operation nothing will better allay restlessness and spare the strength of the patient, than an opiate.

11. Food and drink are absolutely withheld as long as vomiting is present, but rinsing of the mouth is permitted.

12. Murphy's proctoclysis is systematically employed by us, and its use can be warmly recommended. It is important strictly to follow Murphy's directions in the arrangement of the apparatus, so as to avoid hyperdistention of the rectum. Eight to ten pints of normal saline solution will be readily absorbed in 24 hours. The essential point is that the reservoir should not be suspended higher above the level of the buttocks than what is hydrostatically necessary just to overbalance the intra-abdominal pressure. The elevation should have the effect of causing the entrance and absorption of one and a half pints of normal salt solution within from forty to sixty minutes. This quantity is to be given every two hours. "The flow must be controlled by gravity alone, and never by forceps or constriction of the tube, so that when the patient endeavors to void flatus, or when he strains, the fluid should rapidly regurgitate into the can, otherwise it will be discharged into the bed." (Murphy.)

* Dr. Howard Lilienthal has constructed an ingenious trocar cannula for this special purpose by which intestinal contents may be withdrawn without leakage and soiling. ANNALS OF SURGERY, June, 1906.

13. The operation finished, the patient is placed in Fowler's position; this is maintained as long as distention, vomiting, and a high rate of pulse are present.

14. Persistence of fever after the disappearance of vomiting and distention, indicates the search for secondary intraperitoneal abscesses. According to their ascertained situation, these are attacked from in front, or through the loin, or through the vagina or the rectum.

15. Laxatives, usually calomel and salts, are not administered before the stoppage of projectile vomiting.

16. Packings that wall off necrosed areas are left in situ until they become loose and detached by the process of granulation.

To recapitulate, all our measures are dominated by these requirements: early and rapid operation; stopping of leakage; peritoneal drainage aided by posture; maintenance of the patient's strength by enteroclysis; withholding of food and drink while vomiting persists; and, finally, the discreet administration of opiates.

PERITONITIS FROM OTHER CAUSES THAN APPENDICITIS.

We shall conclude this paper by giving a synopsis of 148 cases of free progressive peritonitis observed in the indicated period at Mount Sinai Hospital, which were due to other causes than appendicitis:

TUMORS.

	Died.
Perforation of ulcerated carcinoma of stomach.....	1
Perforation of ulcerated sarcoma of jejunum.....	1
Perforation of carcinomata of large intestine.....	3
	—
	5

Mortality, 100 per cent.

PERITONITIS DUE TO INTESTINAL PERFORATIONS.

	Recovered.	Died.
Gunshot injuries	3	
Perforations of rectum by syringe point during administration of enema.....		2

Subcutaneous rupture of intestine by external force	1	4
Penetrating wound of abdomen and intestine from a sharp piece of wood.....	1	
Perforation of ileum by fishbone.....	1	
Ulcerative perforation of intestine (non-typhoid)	5	
	4	13
Total		17
Cured		14
Died		13
Mortality, 76.5 per cent.		

In all the four cured cases, only a few hours had elapsed between injury and operation. Most of the fatal cases were in extremis when admitted.

PERITONITIS CAUSED BY COMPLICATIONS OF HERNIA.

Of sixteen (16) cases, ten (10),—when admitted with diffuse spreading peritonitis due to gangrene, with or without perforation of the strangulated intestine,—were in such a bad condition that nothing could be done than to withdraw, fasten in the wound, and incise the decayed gut. All of these patients died within a very short time after admission. Four times the general condition of the patients seemed to warrant, in spite of the complicating peritonitis, resection of the necrosed small gut. One of these patients recovered, three died. In one case of strangulated inguinal hernia a diffuse bacillus coli peritonitis was present, though the gut was neither gangrenous nor perforated. Reposition and drainage led to recovery. In one case, a perforation of the small intestine situated 8 cm. above the point of strangulation, was overlooked: The strangulated knuckle was sound and was replaced; the pelvis was drained, but the leak having remained open, the patient died.

	Cases.
Total	16
Cured	2
Died	14
Mortality, 87.5 per cent.	

PERITONITIS DUE TO DISEASE OF THE FEMALE GENITALS.

Sixteen times we had to deal with free spreading peritonitis caused by disorders of the female genitals.

	Recovered.	Died.
Twisted ovarian cyst and gangrene.....		2
Incarcerated fibroid and gangrene.....		1
Criminal perforation of uterus, prolapse and gangrene of small intestine.....		1
Ruptured pyosalpinx		1
Double pyosalpinx	4	2
Infected ovarian cyst after abortion.....		1
	—	—
	4	8
		Cases.
Total		12
Cured		4
Died		8

Mortality, 66.6 per cent.

PERITONITIS DUE TO TYPHOID PERFORATIONS.

	Cases.
Total	23*
Cured	6
Died	17

Mortality, 73.9 per cent.

PERITONITIS DUE TO PERFORATION OF DUODENAL AND GASTRIC
ULCERS.

There were observed altogether 13 cases of peritonitis due to duodenal or gastric perforation. In all the cases, seven (7) by number, where the perforation did not precede operation by more than 24 hours, the patients recovered,—in one case, in spite of the fact that both the lesser and the greater peritoneal cavities were involved.

	Cases.
Total	13
Cured	7
Died	6

Mortality, 46.1 per cent.

* One remained unoperated on.

PERITONITIS DUE TO PERFORATION OF LIVER ABSCESS INTO
PERITONEAL CAVITY.

Out of a total of three (3) cases, one patient was saved. In this instance, the locality of the perforation was ascertained at the time of the operation. The liver abscess was separately drained, then the peritoneum was drained by way of the pelvis. In the two fatal cases the rupture of a liver abscess was revealed only by the autopsy.

	Cases.
Total.	3
Cured	1
Died	2

Mortality, 66.6 per cent.

PERITONITIS DUE TO THROMBOSIS OF MESENTERIC VESSELS.

This disorder caused gangrene of the ascending colon in one case. The patient was moribund at the time of the operation, and died shortly after the establishment of a caecal anus.

	Cases.
Total.	1
Cured	0
Died	1

Mortality, 100 per cent.

PERITONITIS DUE TO VOLVULUS AND INTUSSUSCEPTION.

Intussusception causing peritonitis was observed once only. The infant died a few hours after reduction.

Volvulus complicated with extensive free peritonitis was observed six (6) times. Once only was the twisted gut not gangrenous. In this case the patient died of peritonitis. One patient suffering from extensive gangrene of the cæcum, died at the beginning of anæsthesia. Once, in a case of twisted sigmoid with gangrene, colostomy only could be done, as the patient's condition was extremely precarious. He died. In a case of gangrenous volvulus of the small intestine, we had, on account of the state of the patient, to content our-

selves with attaching the gut to the parietes and incising it. This patient died also. Only twice was the resection of the gut found to be warranted. In one case 45 inches of small intestine were resected, recovery following. In the other, two feet of the gangrenous sigmoid were removed, the patient dying of continued peritonitis.

	Cases.
Total	8
Cured	1
Died	7
Mortality, 87.5 per cent.	

PERITONITIS DUE TO INJURY AND AFFECTIONS OF THE
BILIARY TRACT.

Out of twenty-four (24) cases, acute gangrenous cholecystitis, with or without perforation, was twenty-three (23) times the cause of diffuse progressive peritonitis. Once the malady was complicated with actual parturition, during which the perforation of the gangrenous gall bladder must have occurred. Forceps delivery was done; the patient died so shortly after this that no chance was afforded to operate for the peritonitis. In another case, during the progress of herniotomy for strangulation, the signs of a biliary peritonitis became evident. Exposure of the gall bladder revealed gangrene and perforation of the viscus. Evidently the vomiting due to the biliary peritonitis had caused the strangulation of the hernia. This patient also died. Of the remaining twenty-one (21) patients, eight (8) recovered after operation, which consisted in extirpation of the diseased gall bladder, whenever a suitable living pedicle could be fashioned. Where this was not feasible, the gall bladder was drained by rubber tubing, and the gangrenous parts were segregated by suitable gauze packings. In one instance a child six months old, having been run over by a vehicle twelve days before admission, entered the hospital with far-gone peritonitis. Incision and drainage of the peritoneum were done, but the child died a short time afterward. On autopsy, a rupture of the cystic duct was found.

	Cases.
Total	24
Cured	8
Died	16

Mortality, 66.6 per cent.

PERITONITIS DUE TO ACUTE HEMORRHAGIC PANCREATITIS.

Six times was peritonitis observed caused by acute hemorrhagic pancreatitis. The treatment was incision and drainage. Five of the patients died; one recovered.

	Cases.
Total.	6
Cured	1
Died	5

Mortality, 83.3 per cent.

PERITONITIS DUE TO UNKNOWN CAUSES.

Twenty times patients suffering from far-gone peritonitis of unknown origin were admitted, where, for one reason or another, nineteen times out of the twenty the cause of the disorder could not be ascertained. Six times operation was refrained from as death was imminent. In five of these cases no permission could be secured to perform autopsy. Once autopsy was held, but yielded a negative result. In the fourteen cases that submitted to operation, the cause of the disorder was ascertained twice only: once at operation, leaking tubes were found, this patient recovering; in the other case, the operation did not throw light upon the state of affairs,—on post-mortem, however, infarct of the spleen was uncovered. In another case, on operation, an enormously distended colon was encountered. Colostomy was followed by recovery, and the artificial anus was later closed by operation. The cause of the trouble remained unknown. In the rest of the fatal cases the cause of the peritonitis was revealed neither by the operation nor by painstaking autopsy.

Total of cases	20
Total of operated cases	14
Cured operated cases	2
Died operated cases	12

Operative mortality, 70 per cent.

In concluding, I fulfil a pleasant duty by extending my thanks to my colleague, Dr. Howard Lilienthal, whose material I was permitted to add to that furnished by my own service. As the methods of treatment employed in both services were nearly, if not entirely, identical, this circumstance will not retract from the value of this communication. I also take pleasure in thanking my Adjunct, Dr. Alexis V. Moschcowitz, for collecting and putting in shape the statistical material that has accrued since the publication of his excellent report on 2000 cases of appendicitis, published in *Archiv für klin. Chirurgie*,* and of all our cases of peritonitis of non-appendicular origin.

* Loco cit.

BONE PLASTIC FOR SKULL DEFECTS.

BY E. R. ROST, Major I.M.S.,

OF RANGOON,

Junior Civil Surgeon.

At the Rangoon General Hospital, where cases of compound depressed fracture of the skull are exceedingly frequent, it often becomes necessary to remove large areas of bone. The result of such removal is often to cause large depressed pulsating scars, and several such cases having come under my observation years after operation, caused me to adopt the following curative procedure.

A Burman, aged 32, was admitted to hospital with a sinus discharging sanious pus and leading down to necrosed bone on the right side of the head, over the mid-parietal area. The sinus opening was situated anterior to a depressed pulsating scar, 3 inches long by 1 inch broad, the appearance being unsightly. He complained of slight headache and giddiness and said he had been subject to fits of convulsions every two or three months since the injury, two years previously. He had been operated on for a large compound depressed fracture of the skull caused by a heavy sword-cut about two years before.

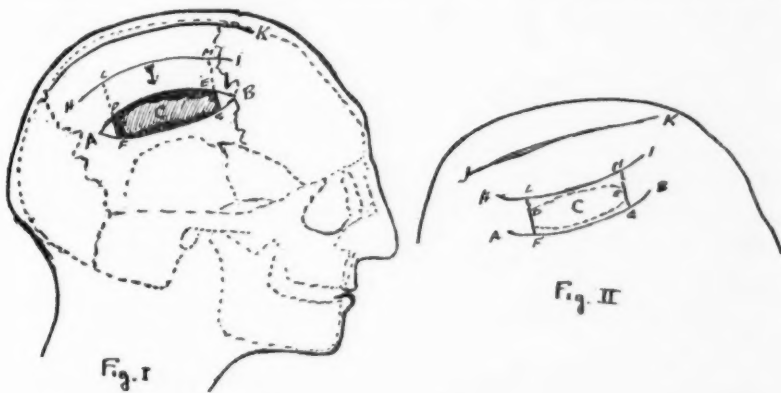
The following operation was devised so as to make a bone flap contiguous with its nutrient supply, to cover over the hole in the skull and to correct the deformity.

Two semilunar incisions *A, B*, around the depressed scar *C*, were made so as to excise the whole of the scar tissue and the sinus leading down to dead bone.

The small piece of necrosed bone, together with the irregular edges of bone, were removed with Hoffmann's bone-cutting forceps and care was taken not to evert the skin flap edges or separate the layers of tissue and periosteum from the bone. A semilunar incision *H, I* was made one and a half inches from and parallel to the semilunar incision *A, B* down to the bone and the bone was cut with a Hey's saw between *L* and *M*, so that *L, M* was equal or slightly longer in length to the edge of the hole in the skull

C. After making a slight cut into the outer table of the bone from *L* to *M* the Hey's saw was turned flat and the outer table of the bone split in half by sawing in the area *L,M,P,E*. Similarly, the outer table of the skull along *P,E* was sawn to meet the sawing from *L,M*. Care was taken not to separate the skin incisions or to allow the periosteum to be injured.

With a narrow chisel the outer table of the bone was cut along *L,P* and *M,E*, and the chisel introduced to finish off and separate the sawn-off portion of bone from the bone below. Thus a flap of bone containing the outer table of bone with its periosteum attached and all the tissues above was separated from the



bone below, and then the whole flap *H,I,A,B*, containing underneath it the quadrilateral piece of bone was slid down to cover over effectually the exposed area *C*. And the quadrilateral area of bone being very slightly larger than the opening in the skull, it could not sink down into the cavity *C*. A still longer incision, *J,K*, into the skin and subcutaneous tissues only was then made to form a skin flap to close the area left by the sliding down of the bone flap, and it was found that the three incisions *J,K*, *H,I*, and *A,B* could be united with sutures without dangerous tension.

The wound healed by first intention and the man was shown at the local branch meeting of the British Medical Association; he had no deformity, no headache or giddiness, and six months after this operation he had had no recurrence of fits.

PING-PONG-BALL INDENTATION OF THE SKULL WITHOUT FRACTURE.

BY WILLIAM H. LUCKETT, M.D.,
OF NEW YORK.

THE following case is reported because we have not seen its parallel in a large series of fractures and other injuries of all description of the skull, and because we have not been able to find its analogue in literature.

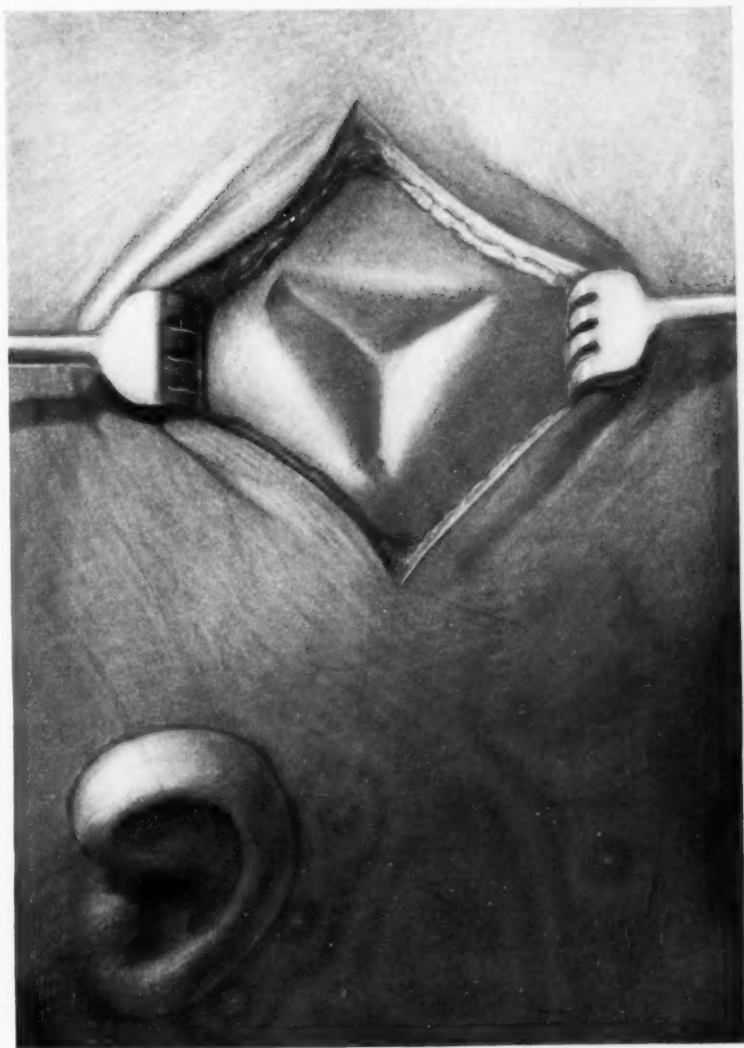
CASE I.—P. L., five and a half months old, was admitted to my service at the Harlem Hospital, June 8, 1908, with the following history: While sleeping, the infant was said to have fallen from a low couch, a distance of less than two feet, striking the left side of the head on the floor. Vomited profusely immediately after the accident, and while rational has been very irritable and refuses the breast.

Physical Examination.—Fairly well nourished infant, conscious. Abdomen somewhat "pot bellied"; slightly enlarged epiphyses; slight "rosary" at junction of the ribs and the sternal cartilages. The posterior fontanelle was closed and the anterior fontanelle was nearly closed. Please note, therefore, that there were no marked signs of a well-developed rachitis.

Over about the centre of the parietal bone on the left side there was a well-marked three-cornered depression, visible both to the eye and on palpation. There was no ecchymosis, abrasion or other external manifestation of the injury on the skull excepting the above-mentioned depression. Pupils normal, react to light, and no change in the fundus; temperature normal, and no marked slowing of the pulse; no local manifestation of intracranial pressure; no muscular rigidity. Mental condition of the child was one of marked irritability.

Operation Under Chloroform.—An incision was made over the depression; the bone exposed, when the depression, a counterpart of that seen before the incision in the scalp, was noted in the skull; viz., a three-sided pyramidal depression with the lines one

FIG. 1.



Indentation o skull without fracture.

and a quarter inch long, the corners of which were represented by curved bone and not by lines of fracture as usual. In other words, we had here a similar tri-cornered depression or indentation noted in a thin celluloid ping-pong ball. (See Fig. 1.) A small quarter-inch button was removed from the bottom of the depression with a small crown trephine attached to a modified Hamilton bone drill. A blunt hook was inserted beneath the skull and traction made; the depressed bone was easily drawn into position. It was noted that when traction was made on the depressed bone, and after it had reached a certain point past the force or power that kept it depressed, the bone popped outwards into place. A small, flat silver probe inserted between the dura and the skull did not reveal a fracture, nor was a line of fracture visible from the exterior. The skull was not quite one-sixteenth of an inch in thickness. The bone button was left out; the scalp was sutured in position; no drainage; wound dressed, and the child returned to the ward in a good condition. The second day following the operation the child was discharged from the hospital, and was treated afterwards in the Out-Door Department, and had an uneventful recovery. In other words, we had here a case of cerebral irritation from pressure of the indented very thin flexible skull without fracture.

We obtained a dozen ping-pong balls and by holding them firmly in the hand and striking both sides consecutively against a solid flat surface reproduced the same tri-cornered depression nineteen times out of twenty-four. The other five depressions were quadrilateral. This tendency to form tri-cornered depressions from a blow produced by a flat surface seems to be characteristic of hollow spherical bodies with thin walls, and might have some medicolegal value relative to injuries of the vault.

TUBERCULOSIS OF THE LIP.

BY GEORGE E. ARMSTRONG, M.D.,

OF MONTREAL.

THERE was admitted to one of my wards in the Montreal General Hospital on February 18, 1907, a man 53 years old, complaining of a sore on his lower lip. His personal history was negative. Father alive, 85 years of age. His mother died when he was three years of age and he does not know the cause of her death. He has no full brothers or sisters. He states that there has never been any lung trouble in the family.

The trouble began as a small red spot that first appeared on the lower lip in November, 1906. It was situated midway between the centre and the angle of the mouth, on the left side. It was not painful, and gradually became covered with a dry, heaped-up scale. He frequently pulled the scale off, when the surface beneath appeared red but did not bleed. The area gradually grew larger. Vaseline, alum and various salves were applied but without benefit.

On admission there was present an ulcerated area on the left side of the lower lip, somewhat oval in outline, about $1\frac{1}{2}$ cm. in length and 1 cm. in width, situated between the midline and angle of the mouth and as much on the mucous membrane as on the cutaneous surface. The edges were somewhat thickened and elevated but not undermined. The base is only very slightly indurated, of a pale yellowish color and dry. For a short distance around the edges of the ulcer the skin and mucous membrane are reddened and slightly infiltrated. One enlarged gland is palpable in the submaxillary region and one in the submental.

The ulcer itself felt soft, and the absence of infiltration and hardness from the base suggested that the condition might not be an epithelioma. In fact, the general appearance of the sore, its history, and the associated conditions, suggest the possibility of its being either a primary sore or a tuberculous ulcer. The former might be excluded from the fact that there was very little induration of the base, although the ulcer had been present for three months; there was no history of any secondaries, and

none were present at the time; also from the fact that the lymphatic involvement was confined to two considerably enlarged discrete glands.

He was a fairly well-nourished man but had suffered from a cough, accompanied by scanty expectoration, for some months. Dulness and fine crepitation were present over both apices and the infraclavicular regions in front. There was dulness over the right upper lobe behind, together with bronchial breathing and whispering pectoriloquy. There was no sign of any ulceration about the tongue, mouth or fauces. The skin of the face was smooth, no rash of any kind being present.

The growth was removed together with the glands. The patient made an interrupted recovery and left the hospital March 7, 1907. The pathologist reported that the ulcer and glands removed were tuberculous without any evidence of malignancy.

Tuberculous ulcer of the lip is very rare, more uncommon, indeed, than tuberculous ulcer of the tongue.

Volkman saw two tuberculous ulcers on the lips. One in a young girl with multiple tuberculous foci and sound lungs, the other in an old woman. In the first case the deep ulcer was removed by a V incision. In the second case caustics had been applied and the resulting sclerosing of the connective tissue together with the thick crusts on the surface, gave it the appearance of a carcinoma for which it was taken.

Schuchardt (*Deut. med. Woch.*, 1889, xv, 1075-76) has reported a large tuberculous ulcer occurring upon the upper lip of a laborer 43 years of age, with good family history. He had always worked very hard and for eighteen months had suffered from shortness of breath and cough and had lost weight rapidly. The ulcer began as a small fissure in the left half of the upper lip and gradually enlarged. There had recently, for about fourteen days, been a discharge from the right ear. He was a large, poorly nourished man, with very flabby musculature, and clear indications of lung disease were present.

On the left side of the upper lip was a defect 3 cm. long and $\frac{1}{2}$ cm. deep throughout its whole extent, so that when the mouth was closed the upper incisor teeth were visible. The

edges were sharply defined. The ulcer extended to the median line, and from below the whole upper lip looked swollen and thickened. The base was covered with thick dry grayish yellow crusts, which, on being removed, left a smooth oozing surface. The teeth were firm and covered with tartar. The gums were swollen, blue in color, and presented small ulcers here and there. On the mucous membrane of the right cheek, opposite the last two teeth, was a small nodular mass the size of a 10-pfennig piece, and in the centre of this was a small ulcer with fissured borders. The border of the mucous membrane around was of a bluish white color, with small gray nodules here and there. There were no ulcers or thickened areas on the tongue. The left half of the velum palati was red. Between the arcus pharyngo and the glossopalatinus was a flat irregularly shaped ulcer with red borders. Tubercle bacilli were found on the base of the ulcer on the lip as well as in those on the cheek and on the palate.

In Lord's case an ulcer appeared first on the right tonsil, and then an irregular small soft ulcer on the inside of the left cheek. Later on the ulcer in the cheek spread to the upper lip, which became greatly swollen, and then extended down to the lower lip. The diagnosis lay between specific disease and epithelioma. Three throat specialists, by whom he was examined, regarded the condition as malignant. The skin lesion presented many of the appearances of specific disease. A section of the skin was removed and examined by Dr. Barker who found it to be tuberculous.

This variety of tuberculosis of the skin would seem to be very rare. In 4000 postmortems made by Chiari, there were only five cases of tuberculosis of the skin, and these occurred in the regions where the mucous membrane and the skin came together on the lips, about the anus, and, in one case, on the skin back of the ear.

There are thus seen to be two distinct groups of tuberculous ulcers of the lips. First, the solitary ulcer beginning on the lip itself, of which my case was an example; and, secondly, ulcerated areas that are secondary to, and invasions

from the mucous membrane of the buccal cavity or to tuberculous diseases of the adjoining skin of the face, as sometimes occurs in lupus.

Tuberculosis should be suspected when an ulcer on the lip or tongue presents a soft base with but little evidence of induration or infiltration, and especially when there are evidences of tuberculosis elsewhere. A diagnosis cannot be definitely arrived at without a microscopical examination. It may be sufficient to examine scrapings from the surface.

SUTURE OF THE RECURRENT LARYNGEAL NERVE.*

WITH REPORT OF A CASE.

BY J. SHELTON HORSLEY, M.D.,

OF RICHMOND, VA.,

Professor of Principles of Surgery and Clinical Surgery in the Medical College of Virginia;
Surgeon to Memorial Hospital.

THE literature on surgery of the recurrent laryngeal nerve is very scanty. A thorough search of the literature in the library of the Surgeon-General's office, at Washington, has not revealed a single case of suture of this nerve in man. Consequently, the case reported below is apparently unique. There has been some work done along experimental lines, in which the left recurrent laryngeal was divided and its distal end inserted into the vagus higher up. These experiments have been carried out chiefly with a view to the cure of a disease in horses called "roaring." This peculiar affection is caused by paralysis of the left recurrent laryngeal which abolishes the function of all the intrinsic muscles on the left side of the larynx except the cricothyroid, a muscle supplied by the superior laryngeal. It always occurs on the left side, as the greater length of the left recurrent laryngeal and its course around the aorta render this nerve subject to any lesion that involves the aorta, or to excessive functional strain upon the aorta. So far as the appearance of the larynx is concerned, resection of the left recurrent laryngeal presents conditions identical with those found in a "roaring" horse.

J. BROECKAERT'S experiments on monkeys (*Annales de la Société de Médecine de Gand*, 1904, p. 209) show results similar to those of like experiments on the dog, the rabbit and the guinea pig. Resection of a portion of the recurrent laryngeal

* Read before the Southern Surgical and Gynæcological Association, December 14, 1909.

nerve was followed by decided and progressive atrophy and degeneration of the external thyro-arytenoid muscle, and by less pronounced nutritive changes in the internal thyro-arytenoid and in the posterior and lateral crico-arytenoids. He thinks that similar effects of resection of this nerve are to be expected in the human subject.

E. COTTERELL (*Veterinarian*, 1893, p. 357) performed operations on three dogs and one donkey. After division of the left recurrent laryngeal nerve, he found the muscles of the left side of the larynx were paralyzed and placed in a condition similar to that in horses affected with "roaring." The recurrent nerve was cut across and its peripheral end carefully dissected out for about an inch. The left vagus was then found and was divided a little higher than the level of the section of the recurrent laryngeal nerve. The end of the peripheral portion of the left recurrent laryngeal was then sutured along with the peripheral end of the cut vagus into the upper end of the vagus. Two experiments on dogs were failures. The third dog on which this operation was done was examined five months and three weeks later and the left side of the larynx was seen to be working well, but not quite so well as the right. Cotterell thinks this was due to the fact that the period of time that had elapsed between the operation and the examination was not sufficient for the nerve to regenerate fully. The dog was killed and the dissection showed that the peripheral end of the left recurrent had united to the vagus. The experiment upon the donkey was done January 30, 1892, and laryngeal examination on April 22, 1893, showed that the left side of the larynx worked synchronously with the right side and just as well. The dissection showed that the peripheral end of the left recurrent laryngeal nerve had united with the vagus.

F. MACDONALD (*Atti del XI. Congresso medico internazionale*, 1894, ii, p. 111) performed somewhat similar experiments, taking a section from the left recurrent laryngeal in order to prevent any reunion with the proximal end and grafting the distal portion into the trunk of the vagus. Two years after the operation, the result was said to be successful.

These experiments seem to prove that surgery of the recurrent laryngeal nerve has a wider field than has heretofore been supposed. If so much of the nerve has been destroyed as to make a direct suture impossible, its distal end can be grafted into the vagus with hope of eventual restoration of function. We must remember, however, that though many

of the experiments quoted were successful, the nervous structure of the human being is more difficult to repair than that of a lower animal. Even in man, different individuals often present variations in their readiness of repair of injured nerves, which cannot be accounted for by obvious conditions.

On account of its anatomical position, lesions are more likely to occur in the left recurrent laryngeal than in the right. Affections of the aorta are a frequent cause of paralysis of the left nerve and diseases and injuries of the thyroid gland may involve either of the recurrent laryngeals. They are sometimes injured during operation on the thyroid gland, and in such cases suturing the nerve should give excellent results. Occasionally, paralysis of the left recurrent, resulting from dilatation of the aorta, might be treated by transplantation of this nerve into the vagus, though, as a rule, the disease of the aorta would contraindicate operation.

In the following case the left recurrent laryngeal was sutured about three months after injury.

Martha J., colored, forty years of age, married for twenty years, has had three children. Her previous health has been good except for the usual diseases of childhood. There is no history of syphilis or tuberculosis. On June 22, 1908, she was shot by a pistol, the ball entering at the lower border of the chin about the median line and just grazing the bone. It was evidently deflected by the bone and took a course downward and to the left, just beneath the skin, to the larynx where it penetrated deeper in the neck. Just above the larynx the bullet so nearly penetrated to the surface that a keloid developed as a result of the injury to the deep layers of the skin. After striking the left side of the thyroid cartilage the bullet took a deeper course, wounding the left recurrent laryngeal nerve. There was only slight bleeding at the time, but the patient's voice was at once affected and was so hoarse that she could not speak above a whisper. She readily recovered from the immediate effects of the injury and was referred to me by Dr. J. S. Gale, of Ivor, Va., on August 17, 1908. The bullet was located with the X-rays in the left side of the root of the neck, about half way between the clavicle and the outer border of the trapezius muscle. The patient could not

speak above a whisper and seemed to have considerable difficulty in breathing. The condition of the larynx is described below in the report of Dr. Miller.

Operation was performed under ether August 20, 1908. The bullet was first removed and an incision was made along the anterior border of the left sternomastoid muscle. The centre of the incision corresponded to the lower limit of the larynx. The sternomastoid, together with the carotid artery and the jugular vein, was retracted toward the left. The left lobe of the thyroid gland was exposed and was retracted along with the trachea and larynx to the right. The recurrent laryngeal nerve was identified where it runs in the groove between the trachea and œsophagus. It was found to be injured just before its entrance into the larynx and was involved in a small mass of scar tissue where the bullet had evidently grazed the nerve. The diseased portion, about one-third of an inch in length, was excised, leaving a small filament, which was probably the posterior portion of the sheath of the nerve with a few fibres that had escaped direct injury. The proximal part was freely loosened to relieve tension and the nerve was sutured with No. 0 twenty-day chromic catgut in a fine curved needle. Some muscular tissue was drawn over the sutured nerve. The skin was closed with interrupted silkworm gut. The patient had difficulty in breathing before the operation and seemed to suffer from dyspnoea to such an extent that the anæsthesia was begun with some apprehension. However, she stood the anæsthetic well and reacted satisfactorily.

August 23, 1908, it was noted that the voice and dyspnoea were the same as before the operation. August 29, 1908, the wounds had healed perfectly, but there was no improvement in speech. The patient was discharged August 29, 1908. The dyspnoea disappeared before speech improved. On the last examination, November 16, 1909, the patient could breath without difficulty.

Dr. Clifton M. Miller, professor of rhinology and laryngology in the Medical College of Virginia, examined this patient the day before operation and on two occasions since operation. I am much indebted to him for the examinations and for his reports.

August 18, 1908, the day before operation, he wrote as follows: "I have to-day examined the patient, Martha Johnson, sent by you for laryngeal examination. Her voice is extremely hoarse and produced with effort. Intralaryngeal examination reveals

complete paralysis of the left vocal cord, except such tension as is given it by the action of the left cricothyroid muscle. It lies in the cadaveric position. During phonation the right cord in adduction passes the median line in an effort to approximate the left cord, which remains motionless. The larynx is much congested in the entire supraglottic portion. Diagnosis: complete paralysis of the left recurrent laryngeal nerve."

October 26, 1908, Dr. Miller made the following report: "I examined the throat of Martha Johnson on October 20, 1908, and found that there is some very slight movement of the left vocal cord in the part that was motionless at the time of my last examination and there is less congestion in the larynx than was present at that time."

November 16, 1909, more than a year after his second examination, Dr. Miller wrote the following report: "I examined the colored woman, Martha Johnson, that you sent me for laryngeal examination a few days ago. There is almost perfect motility of her vocal cords, the left one lagging slightly behind the right in adduction, but the action of the laryngeal muscles indicates almost perfect recovery from the wound of the recurrent laryngeal nerve with practically entire restoration of function. The voice, while entirely changed from the hoarse tone of my former examination, lacks much in volume. This is due to a web-like adhesion between the anterior third of the vocal cords, limiting the size of the column of air which can pass through the rima glottidis, and also the length of cord that can be thrown into vibration for voice production. Section of this web with prevention of adhesion during healing would, in my opinion, entirely restore the voice. The adhesion between the cord is due, I think, to inflammation set up by the passage of the bullet and the long period of loss of function of the left cord. From the stand-point of restoration of function by anastomosis of the severed nerve ends, the case is a perfect success."

UNILATERAL LAMINECTOMY.*

BY ALFRED S. TAYLOR, M.D.,
OF NEW YORK,

Visiting Surgeon to Fordham Hospital; Attending Surgeon to New York City Children's Hospitals and Schools; Assistant Surgeon to the Babies' Hospital; Consulting Surgeon to Tarrytown (N. Y.) Hospital.

IN December, 1908, while considering the resection of posterior spinal roots, the thought suggested itself that a procedure less extensive and bloody than the usual bilateral laminectomy would be desirable.

A series of trials upon the cadaver made it evident that ample room could be had by unilateral laminectomy, not only for resection of nerve roots within the spinal dura, but for many of the other purposes for which the spinal canal is opened.

So far as I know the operation is original, and was first done upon the living subject on December 16, 1908, in a case of Dr. T. P. Prout's. Since that time occasion has arisen to use the same technic upon various parts of the spine in four other cases (five in all).

The operation is as follows: The patient is placed face downward, sometimes flat, sometimes with the body slightly tilted to one side. In the five cases operated upon ether has been used. The incision is made just to one side of the spinous processes, and of sufficient length for the purpose in hand. The knife is carried close to the sides of the spinous processes down to their bases. A broad deep retractor is used to pull the muscles outward (incidentally stopping hemorrhage) and the deeper layers of muscle are easily separated from the laminae by a periosteal elevator. Gauze pads stuffed firmly into the wound and left for three minutes will give a dry field. When the pads are removed and the muscles well retracted, there are exposed the lateral surfaces of the spinous processes

* Read before the New York Neurological Society, December 7, 1909.

and the dorsal surfaces of the laminae as far outward as the articular processes.

With a Doyen saw the laminae are divided at their junction with the bases of the spinous processes, the line of section passing somewhat downward and inward (in the operating position). Another line of section is made well out toward the articular processes and is slanting like the preceding one (Figs. 5, 6 and 7). The laminae vary in thickness in different parts of the spine, being thinnest in the cervical region, then increasingly thick downward through the dorsal and lumbar regions to the sacral region where they are as thin as in the cervical region (3 to 8 mm.). The saw has a guard by which the depth of the saw-line may be controlled. Moderate experience, however, teaches one to determine by the feel of the unguarded saw when it has divided the bone. This may seem a hazardous method, but the considerable fat layer surrounding the dura and the volume of spinal fluid within the dura eliminate any real danger to the cord if the saw is handled with nicety. Hemorrhage has not been a factor in the cases so far done.

After the sawing is completed, a thin periosteal elevator is slipped beneath the lowest lamina which is raised sufficiently for a bone forceps to grasp and remove it, care always being used not to tilt the fragments so as to endanger the cord. The remaining laminae are lifted out with the forceps.

In cases where only a small exposure is needed, one lamina may be removed by the use of the saw, and the remaining ones cut away with special rongeurs (Figs. 1, 2, and 3). This method does not give so advantageous an exposure for the exploration of the other side of the canal, because so favorable a slant at the base of the spinous process cannot be obtained with the rongeur.

After removing the laminae, the extradural layer of fat and veins is divided longitudinally in the middle of the wound, which is then gently packed with gauze to stop bleeding. After a few minutes the gauze is removed and the shiny dura is exposed in the bottom of the wound (Fig. 8).

The dura is divided longitudinally. First a short slit is made with a pointed knife to let the spinal fluid, which spurts

FIG. 1.

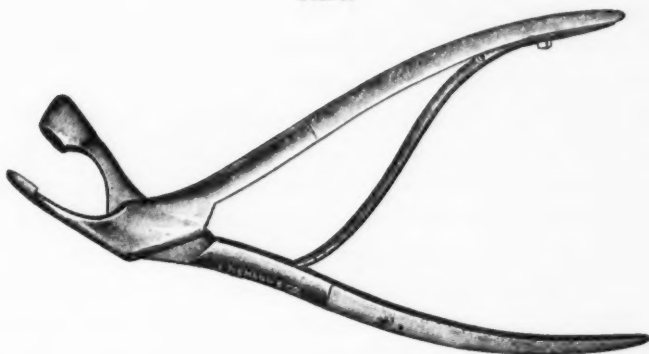


FIG. 2.



FIG. 3.



out, escape slowly. The division of the dura is completed with scissors, exposing the cord and nerve roots for whatever surgical attack is contemplated. Afterward the dura is closed

with a continuous catgut suture; the muscles are sutured to the interspinous tissues with chromic gut; the aponeurosis is closed with chromic gut; and the skin with silk.

No drainage is used. A firm sterile dressing is fastened by adhesive straps and a bandage. The patient lies mostly upon the sides or face during the healing process.

The exposure obtained by this method varies in width with the portion of spine involved. In the adult cadaver the following spaces were obtained: midcervical, $1\frac{3}{4}$ cm.; middorsal, 1 cm.; midlumbar, 1.3 cm. or even $1\frac{1}{2}$ cm., by encroaching somewhat on the articular processes; midsacral, $1\frac{1}{2}$ cm.

This approach permits the resection of the nerve roots on both sides of the cord without injury to the cord substance. This I have done upon the cadaver many times, and once upon the living subject, in the middorsal region.

In the region of the cauda equina it would be possible to anastomose motor roots of opposite sides.

In tumors of the cord this method gives an admirable exploratory approach. In many cases, I feel sure, there would be ample room for the removal of the tumor without further destruction of bone. With a large tumor, this method, by exposing its exact size and location would enable the operator to remove just enough of the opposite laminae for the easy extirpation of the tumor, and would thus minimize the loss of bony protection to the spinal cord.

This approach would almost certainly prevent the mishap reported in two cases by Dr. Joseph Fraenkel at the November meeting of this society, where the usual bilateral laminectomy failed to expose cord tumors which were found at autopsy to lie on the anterior aspect of the cord.

In unilateral laminectomy the side of the cord is well exposed and its anterior surface may readily be explored without injury to the cord substance (Figs. 8 and 9).

When the wound is completely sutured, the spinous processes are in their normal positions, there is no visible or palpable deformity of the back, and, because of the thick muscle pad overlying the laminae, no form of examination, other than

FIG. 5.



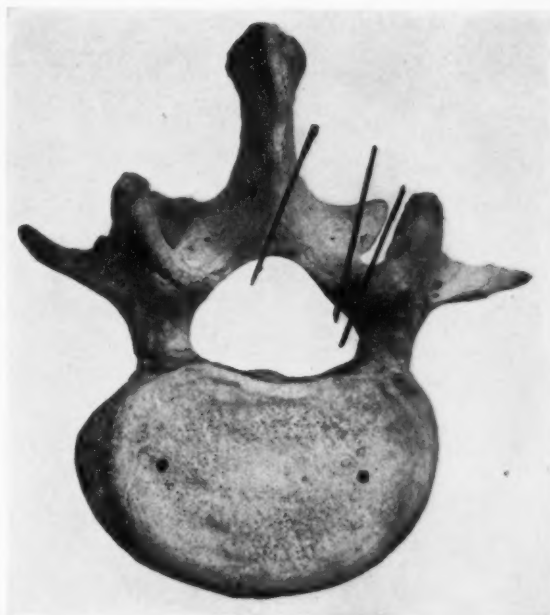
Fourth cervical vertebra.

FIG. 6.



Seventh dorsal vertebra.

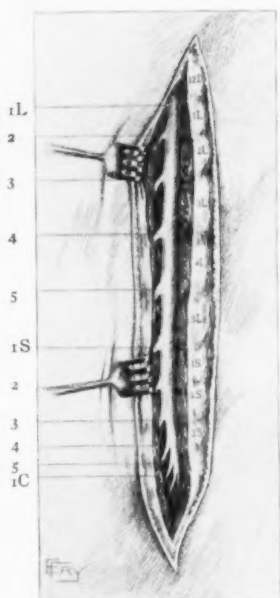
FIG. 7.



Third lumbar vertebra.

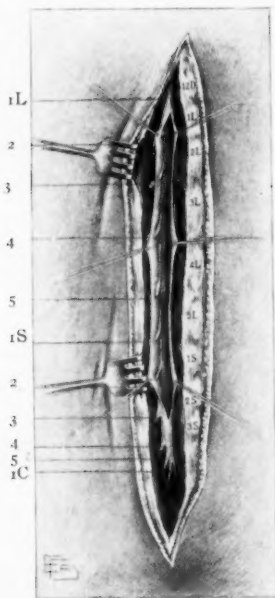
These vertebrae are life size, but come from a spinal column smaller than the average. The ink lines indicate the usual slant and position of the saw cuts. In Fig. 7 the outer cut is used when the articular process is sacrificed to gain more room. The laminae in Figs. 6 and 7 are not so thick as they seem, because they are not photographed on edge.

FIG. 8.



Drawing from a dissection, showing unilateral laminectomy in the lumbar and sacral vertebrae. In this case the articular processes were encroached upon as in the outer line of section Fig. 7. The spines of the vertebrae are numbered on the right and the nerve roots on the left in the drawing. The artist has placed the roots a little too high to correspond properly with the spinous processes. The free view of the cord and the ease of exploring its lateral and anterior aspects is evident.

FIG. 9.



Same as Fig. 8, with the dura opened longitudinally. The same remarks apply to the relations of the roots to the spinous processes. Also the lower end of the cord itself should show at the level of the second lumbar spinous process. The cauda equina is easy to manipulate because of the length of its component bundles.

FIG. 10.



FIG. 11.



FIG. 12.



Case II. Boy, eight years old. Three months after operation.—Figures 10, 11 and 12 show the postoperative flexibility of the spine. The laminae removed lie between the ink marks. In Fig. 12 the dorsal linear scar shows faintly.

FIG. 13.



FIG. 14.



Case III. Boy, 17 years old. Eleven days after operation.—Figures 13 and 14 show the postoperative flexibility of the spine. The laminae removed are indicated by the ink marks.

the X-ray, can determine the loss of bone. The cord, therefore suffers practically no loss of protection.

In all of the cases so far done (five in number) there has been little or no shock, primary union has resulted, and there has been no loss of flexibility of the spine (Figs. 10 to 14 inclusive).

Much has been said of the dangers of allowing the spinal fluid to escape. In these cases it has escaped freely (6 to 12 ounces in different cases, estimated) and yet there has been little or no shock, and convalescence has been uneventful, so that the causes of the complications reported should, perhaps, be sought for elsewhere.

Systematic records of blood pressure, pulse and respiration during operation have not been kept. At the last operation Dr. Creevey noted that when the dura was first opened and the spinal fluid spurted out, there were one or two deep respirations, after which the breathing continued as before. There was no change in the pulse.

The neurological results in these cases will be reported at a later time by the neurologists for whom the operations were done.

The advantages of unilateral laminectomy are believed to be: Minimum loss of blood and of bone; and therefore minimum loss of bony protection to the cord. No postoperative deformity of the back or loss of flexibility of the spine. Exposure sufficient for all exploratory work except in certain cases of fracture of the spine; for all nerve root work on one or both sides; for the removal of many tumors, and for minimizing the operative trauma in others by first exposing their exact size and location. Exposure such as to diminish the chance of overlooking an anterior tumor.

DEFORMITIES OF THE RENAL PELVIS.*

BY W. F. BRAASCH, M.D.,

OF ROCHESTER, MINNESOTA,

Physician to St. Mary's Hospital.

DURING the past year my attention had been called repeatedly to the fact that moderate dilatation of the renal pelvis occurred in conditions other than hydronephrosis; furthermore, that the ureteral catheter could meet with obstruction in the pelvis without a stone being present. Both these data were acquired with the aid of the ureteral catheter in various pathological renal conditions, more often with hypernephromata. Most of the hypernephromata removed in the clinic at St. Mary's Hospital showed on section marked deformity of the renal pelvis; either irregular dilatation of the pelvis, entire or in part, or encroachment upon the pelvic lumen by projections of the surrounding tumor substance. It occurred to me that a radiographic demonstration of these deformities could be of considerable aid in the diagnosis of hypernephromata, frequently so difficult to establish clinically. Our first plates were made last spring. A weak solution of argyrol was injected through the ureteral catheter into the renal pelvis and the radiograph made. These plates were not very satisfactory.

Upon investigation it was found that Prof. Voelcker of Heidelberg had made a radiographic demonstration of the outline of the renal pelvis over two years ago, using collargol as the injected medium. He had demonstrated several cases of hydronephrosis in this manner and suggested further possibilities of this method as an aid to renal diagnosis.

Using a 10 per cent. solution of collargol as the injected medium in subsequent radiographs, we were able to outline the pelvis quite definitely. The radiographs (Plates I to 18, page

* Read by invitation, before the Society of Clinical Surgery, Rochester, Minnesota, Oct. 30, 1909.

540) will illustrate some of the pelvic deformities and associated data which we have demonstrated by this method.

1. *The Normal Pelvis.*—Variations will be considerable in the normal outline. The number, depth, breadth and contour of the calyces will vary greatly. The extent to which the free wall of the pelvis will distend beyond the kidney border will differ; nevertheless there are limits to which the normal outline is confined.

PLATE 1.—The radiograph shows the outline of a renal pelvis in a post-mortem specimen. It is necessarily more clearly defined than if the kidney had been in the living subject. That the free wall does not give way more is probably to be explained by post-mortem tissue changes. Why the renal pelvis at postmortem usually shows a cubic content of from 2 to 5 c.c., whereas in the living it is often found to hold as much as 20 c.c., or more, may be explained by these post-mortem changes.

PLATE 2.—This is the outline of a normal renal pelvis. The several calyces and rounded papillæ between are clearly outlined. The free wall is seen bulging moderately and tapering into the upper part of the ureter, which is shown as far down as the collum uretericum. At this point of narrowing the collargol is usually prevented from running back alongside the catheter.

PLATE 3.—This plate shows the normal outline of a pelvis in a floating kidney. The pelvis contained 18 c.c. of injected fluid before artificial renal colic was produced. The patient was aware that the kidney was moveable, and complained of more or less pain in that side. The ureter is clearly outlined by the collargol within the ureteral catheter and shows no evidence of a kink. There is no return flow alongside the catheter, otherwise it would be shown in the plate.

PLATE 4.—Here again is shown the outline of a normal pelvis which might be mistaken for that of a small hydronephrosis. Its actual size may be slightly exaggerated by the kidney moving with the respiration of the patient. The seeming detached shadows of the calyces is a peculiarity sometimes found. The plate shows in a striking manner the return flow along the side of the catheter.

PLATE 5.—This also shows the outline of a normal pelvis which contained 20 c.c. It is of interest, in that it shows the extent to which the free wall can bulge without a hydronephrosis being present.

2. *Hydronephrosis.*—Heretofore in demonstrating surgical dilatations of the renal pelvis we have employed the method introduced by Kelly, *i.e.*, determining the amount of fluid injected into the pelvis necessary to produce renal colic. If correctly employed, this method should rarely permit of error.

However, in small dilatations and with impassible ureteral obstructions there may be doubt in some cases. Again, unless familiar with the technic one might interpret the findings falsely. Furthermore, to have a condition unmistakably outlined "in black and white," as shown in the following plates, is a source of satisfaction.

PLATE 6.—Here the pelvic outline is very evidently larger and more irregular than that of the normal pelvis previously shown. This is the pelvis of a small hydronephrosis holding about 50 c.c.

PLATE 7.—This plate shows a larger though still moderate dilatation containing about 20 c.c. The sac is pyramidal and is made of the dilated pelvis at the base tapering into the dilated first part of the ureter. This is due to the fact that the ureteral constriction is at some distance below the pelvis, in this case an anomalous blood-vessel.

PLATE 8.—Here a rather large dilatation containing 150 c.c. is demonstrated. The sac is seen bulging out beyond the outline of the kidney. The calyces are seen shallow and broad, as is usual in hydronephrosis, unless inflammatory changes intervene.

PLATE 9.—A still larger dilatation is seen, occupying the left upper abdominal quadrant. All vestiges of the calyces and pyramids are destroyed.

PLATE 10.—This is an extreme dilatation filling the left abdomen. On operation an immense fluid-filled sac with but a rim of functionless cortex was found.

3. *Etiological Factors.*—In several of the plates etiological factors in the dilatation were quite clearly shown. Referring back to Plate 6, it will be seen that opposite the shadow of the renal pelvis is a marked scoliosis involving the second lumbar vertebra. That scoliosis may indirectly be an etiological factor in hydronephrosis has been previously suggested.* At operation, a band of tissue, the evident result of some para-vertebral inflammatory process, was found to be constricting the ureter and causing pelvic dilatation. Anomalous renal blood-vessels usually constrict the ureter near the level of the lower pole of the kidney, into which they pass. As a result one would expect an elongated or pear-shaped dilatation. This is clearly demonstrated in Plate 7, where such a vessel was the direct cause.

* Israel: Chirurgische Klinik der nieren Krankheiten.

PLATE II.—The outline of this dilatation will be found to differ considerably from the general type of those preceding. It is seen to be less rounded and is very irregular with several small detached shadows. This pelvis is a tuberculous hydronephrosis and is typical of an inflammatory dilatation.

PLATE I2.—While not exactly relevant to the subject, the plate illustrates a ready source of error in radiographic diagnosis. It is to be inferred here that the wire stilette is in direct line with an ureteral stone. A hydronephrosis on the same side, having been previously demonstrated by fluid measurement, renders the inference still more favorable. However, on referring back to Plate 9 no evidence of a dilated ureter is to be seen. The rounded hydronephrotic sac is seen extending abruptly from the normal calibrated ureter. This would be inconsistent were the stone the cause. At operation no evidence of a ureteral stone was found.

4. *Hypernephromata*.—Of the 30 hypernephromata removed in the clinic at St. Mary's Hospital, nearly all show more or less deformity of the renal pelvis. We have been able to demonstrate this deformity clinically in three collargol plates. The surrounding neoplasm may cause either necrosis or diminution in the size of the pelvis. The dilatation is due, in the first place, to retraction of the walls of the pelvis by the surrounding tumor. This is clearly demonstrated in Plate 13. The pelvis will be seen to be cylindrical and abnormally broad at the ureteropelvic juncture. The infundibula will be seen short and broad. The removed kidney showed changes in the pelvic outline exactly corresponding to those seen in the collargol plate. The pelvic dilatation may be confined to a single calyx, drawing it out into abdominal lengths, as shown in Plate 14. Again, the dilatation may be due to secondary degeneration of the surrounding tumor with consequent sacculatation of the pelvic walls, as seen in several of our specimens. If, however, the neoplasm encroaches upon the pelvic lumen, marked diminution in size and content may result. Frequently but a small space is left of the former pelvis. In one of our plates it is shown as a small and irregular area at the end of the ureter. The plate is, however, so dim that the shadow could not, unfortunately, be clearly reproduced in a print. In several of our specimens, a tongue of the tumor extends into the pelvic lumen, reaching even to the ureteropelvic juncture. In such cases a wedge-like shadow should be cast between the

lateral collargol streaks. How often the pelvic deformity accompanying hypernephromata can be definitely shown in collargol plates remains to be seen. It is, however, significant that in the three hypernephromata so far radiographed by us, the abnormality was demonstrated in all.

5. *Solitary Kidney.*

PLATE 15.—This plate shows the pelvis of a solitary kidney. The patient presented herself with symptoms of gall-stones. On examination a tumor was palpated in the right upper abdomen which was regarded as an enlarged kidney. Cystoscopic examination showed urine from the right side only. Thirty c.c. of collargol solution were injected into the pelvis before causing any pain. The collargol plate shows a pelvis about the normal size. Although abnormally large, the pelvis shows a normal contour; the papillæ are not flattened nor are the calyces wider, as in a hydronephrosis. The plate makes the diagnosis of a single hypertrophied kidney quite evident. The patient was operated upon for gall-stones and on exploration the kidney diagnosis was confirmed.

6. *Localization of Renal Stone.*—Frequently a shadow is seen in the region of the kidney and its exact relation to the pelvis is in doubt. If the stone is within the pelvis its shadow will be either obliterated in a collargol plate, or it will appear dimmed by the surrounding collargol shadow. If the shadow is shown to be distinct from the pelvis, in a collargol plate, the stone must be without the pelvis. Its relative position in the cortex may then be inferred, particularly if the shadow of the kidney can be brought out in the plate.

PLATE 16.—This gives the dense shadow of a large stone showing the paler collargol shadow. It is thus necessarily located in the pelvis. The pelvis is seen to be greatly dilated and irregular.

7. *Hydro-ureter.*

PLATE 16.—This plate also demonstrates the possibility of ascertaining the condition of the ureter. Ureteral cathetization in this case showed obstruction in the ureter just beyond the meatus. This was passed with difficulty and a dilatation above was suspected from the ease with which the catheter slipped up beyond. Injected collargol shows the widely dilated ureter as seen in the plate. The dilatation is seen to extend up as far as the collum uretericum, thence the ureter narrows tortuously to the dilated pelvis. Unfortunately the plate does not show

the dilated portion of the ureter, which on operation was found extending down to the bladder. Quite frequently that portion of the ureter above a ureteral stone will be found at operation to be dilated. This can often be demonstrated in a collargol plate, and may be valuable evidence in proving the existence of an obstruction which the unaided radiograph does not show.

8. *Essential Hæmaturia.*—Renal hemorrhage is a very perplexing condition to deal with. The radiograph being negative we must still consider the possible presence of a surgical condition. Pelvic deformities other than those accompanying hypernephromata may exist when caused by pelvic papillomata and angiomas, varicose contracted conditions of the pelvic wall, and occasionally cystic kidneys. These deformities may frequently be suggested by collargol radiographs.

PLATE 17.—This is the radiograph of a pelvis in a case of essential clinical hæmaturia. The hæmorrhagic urine was seen on cystoscopic examination exuding from the affected meatus. The pelvis is irregular and quite different in outline from the normal pelvis. One calyx is seen to extend upward abnormally as a long thin crevice. Unfortunately the man was not operated upon.

PLATE 18.—This shows the pelvis taken in another case of essential hæmaturia. The pelvis appears quite normal in outline. Nothing in the patient's history seemed to warrant an exploratory operation.

9. *Tumor Differentiation.*—It is common experience to meet with abdominal tumors whose clinical identification is difficult. Large pancreatic and ovarian cysts, intestinal, gall-bladder and stomach tumors, and various peri-renal growths with indefinite histories, may be easily confused with renal conditions. In such cases if a collargol radiograph is made, and the renal pelvis is found to be in the *normal position* and with a *normal outline*, the tumor is probably not renal. On the other hand, renal tumors may be so low as to simulate tumors of the neighboring organs. It will be remembered that in Plate 11 a pyonephrosis was demonstrated. The patient in this case presented an abdominal tumor so low as to lead us to suspect it to be in the cæcum. The clinical history also supported this supposition, even though cystoscopic examination showed pus from that side. The collargol plate, how-

ever shows the pelvis to be unusually low and corresponding to the tumor felt.

In presenting these plates I realize that the possibilities of the method have not been fully developed. Furthermore, that it remains to be seen how often the method will prove to be of practical diagnostic value. That it is of value in some conditions is evident from the accompanying radiographs. It is also self-evident that much of the success of the method will depend upon the excellence of the radiograph. The accompanying prints scarcely do justice to the radiographs from which they were made. The original plates were made by Dr. V. J. Willey.

PLATE I.



PLATE 2.

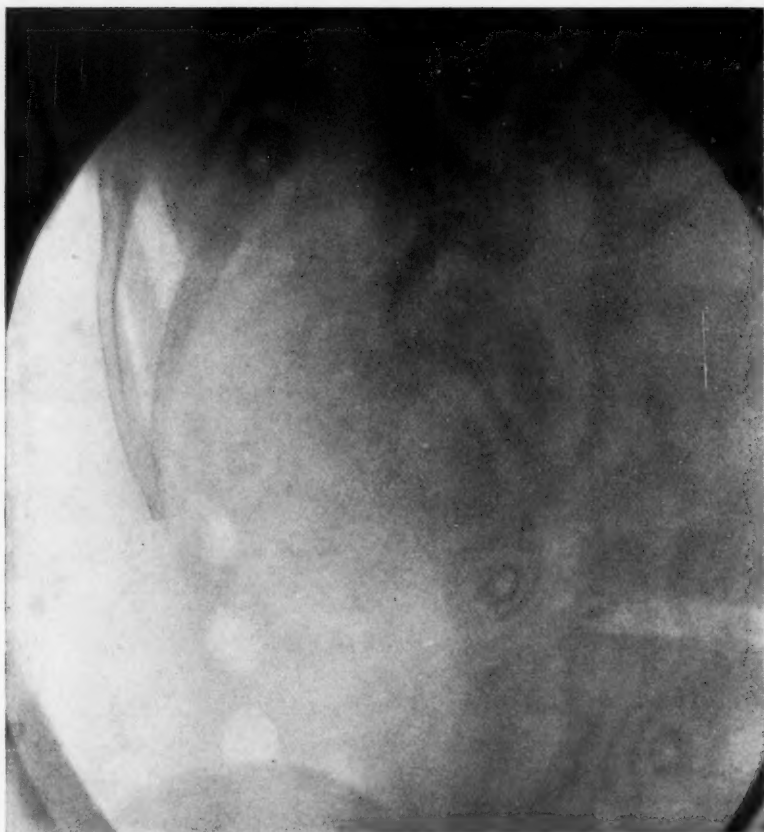


PLATE 3.



PLATE 4.

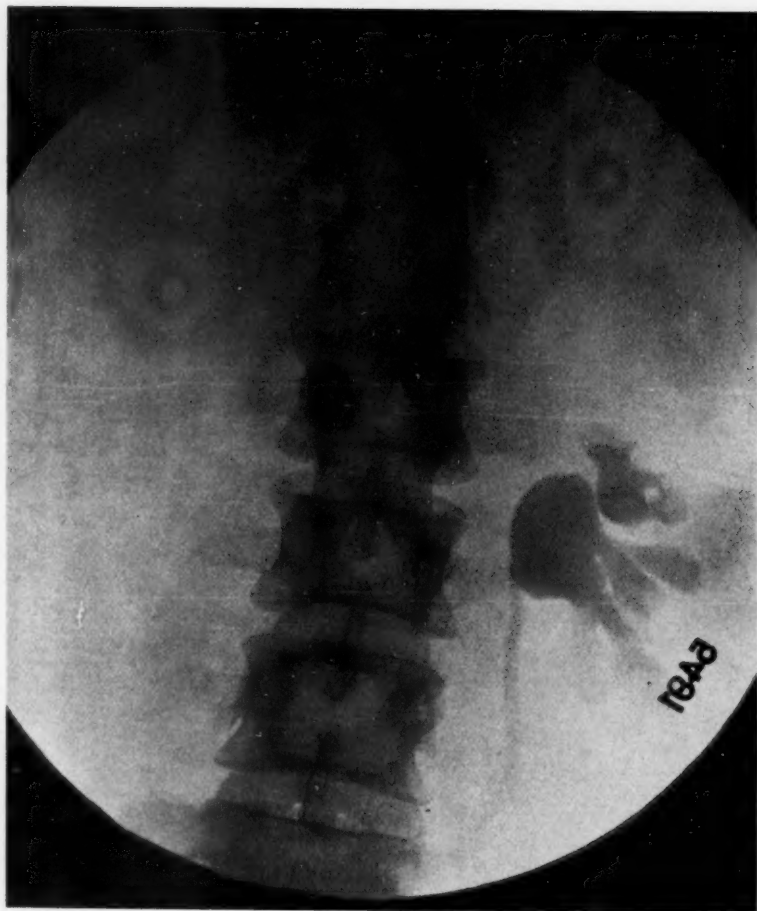


PLATE 5.



PLATE 6.



PLATE 7.



PLATE 8.

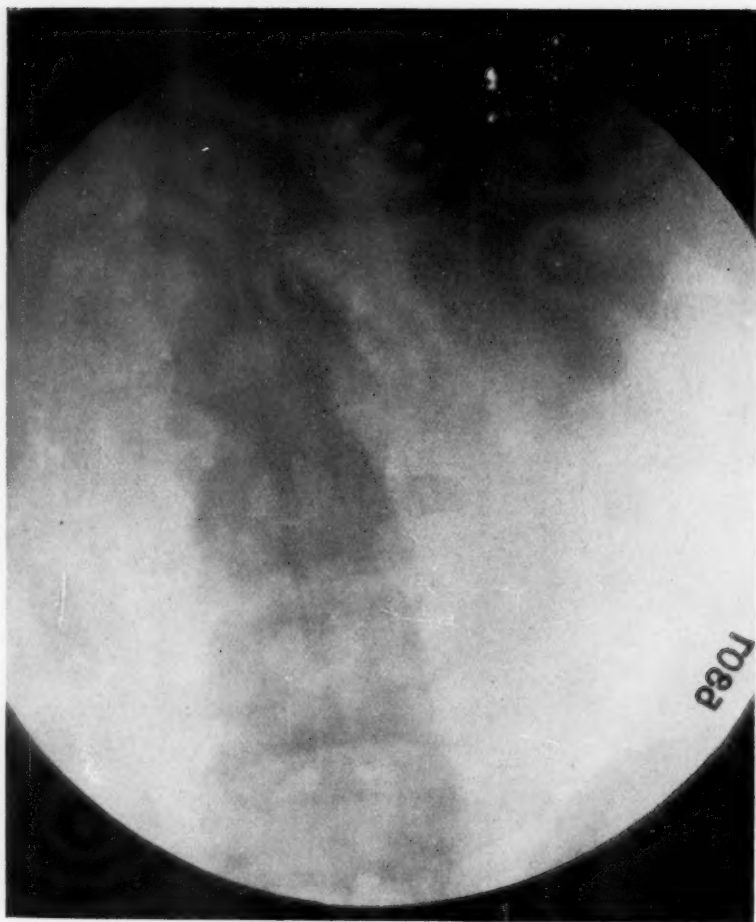


PLATE 9.

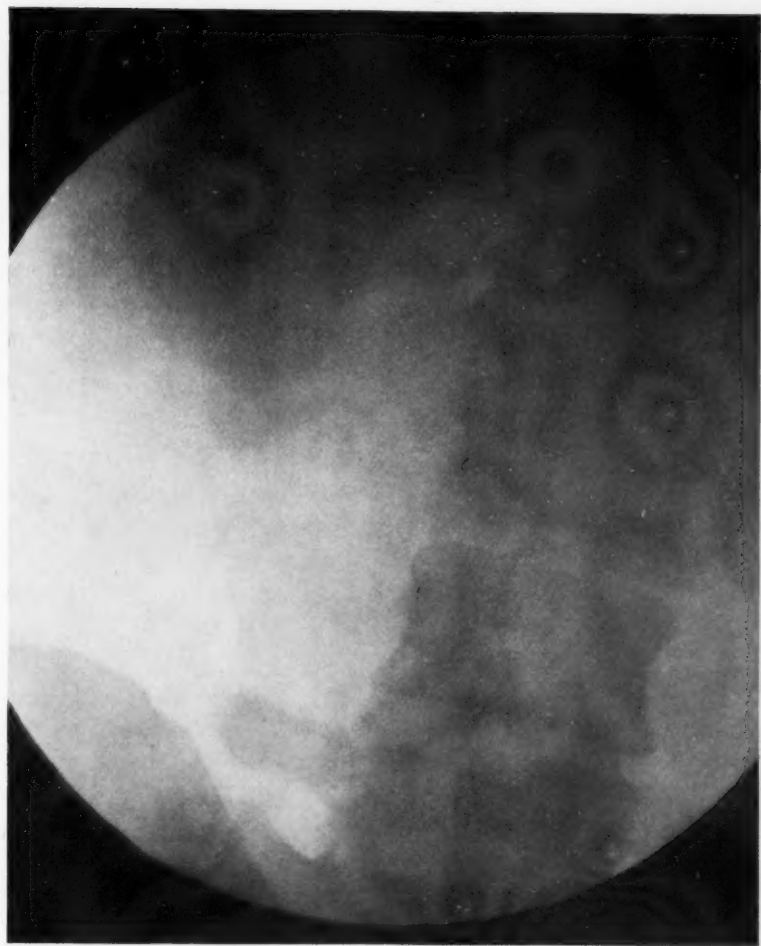


PLATE 10.



PLATE II.

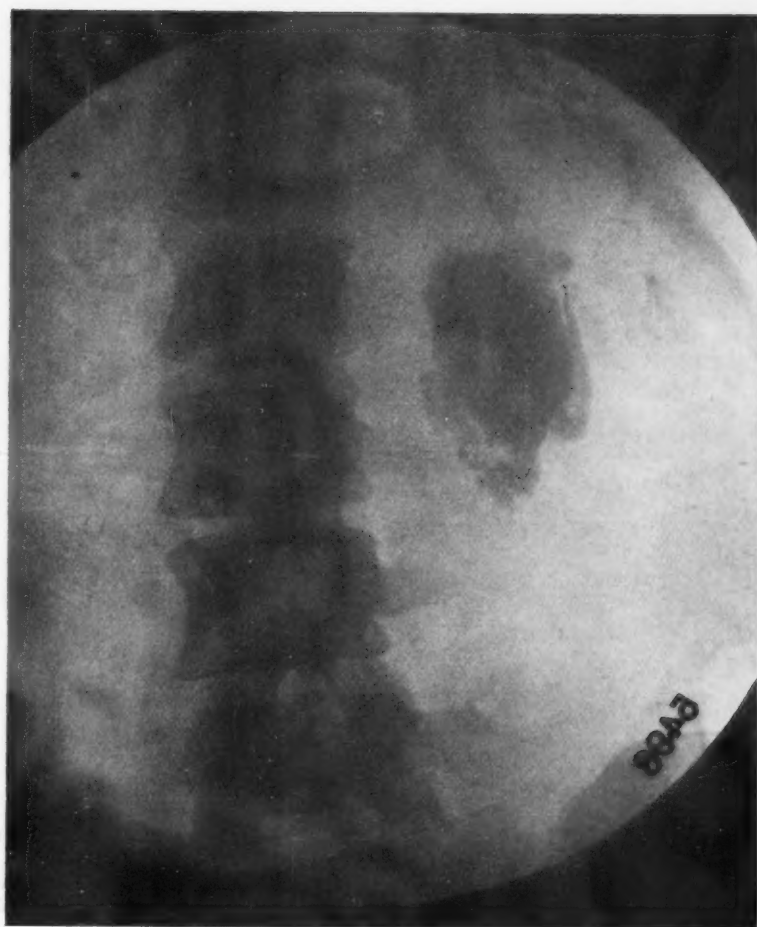


PLATE 12.



PLATE 13.

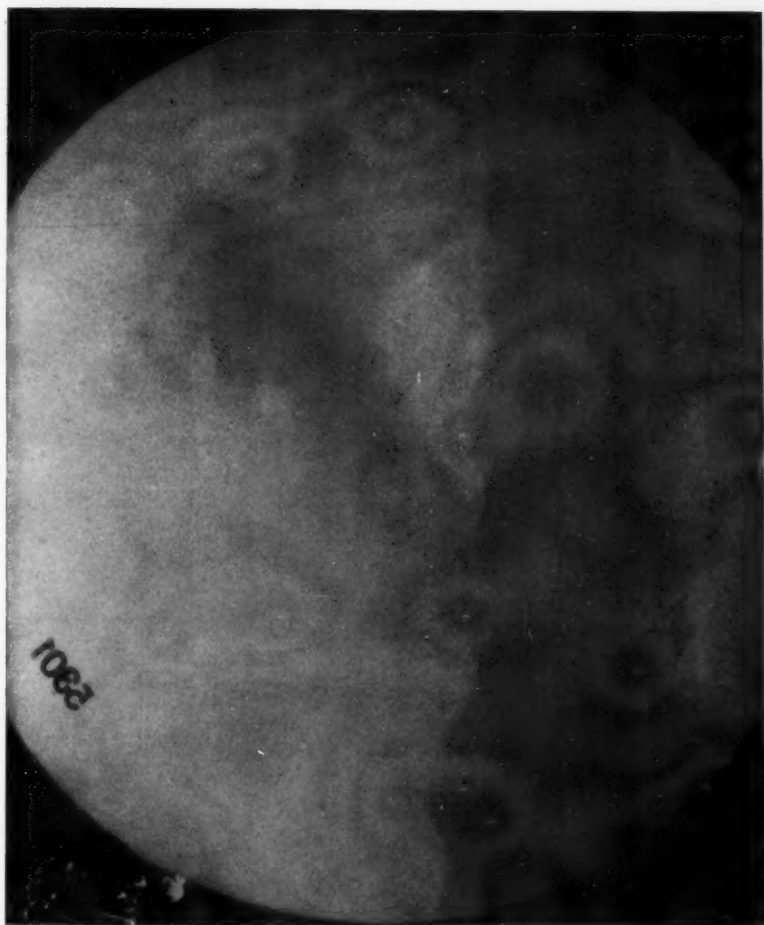


PLATE 14.



PLATE 15.

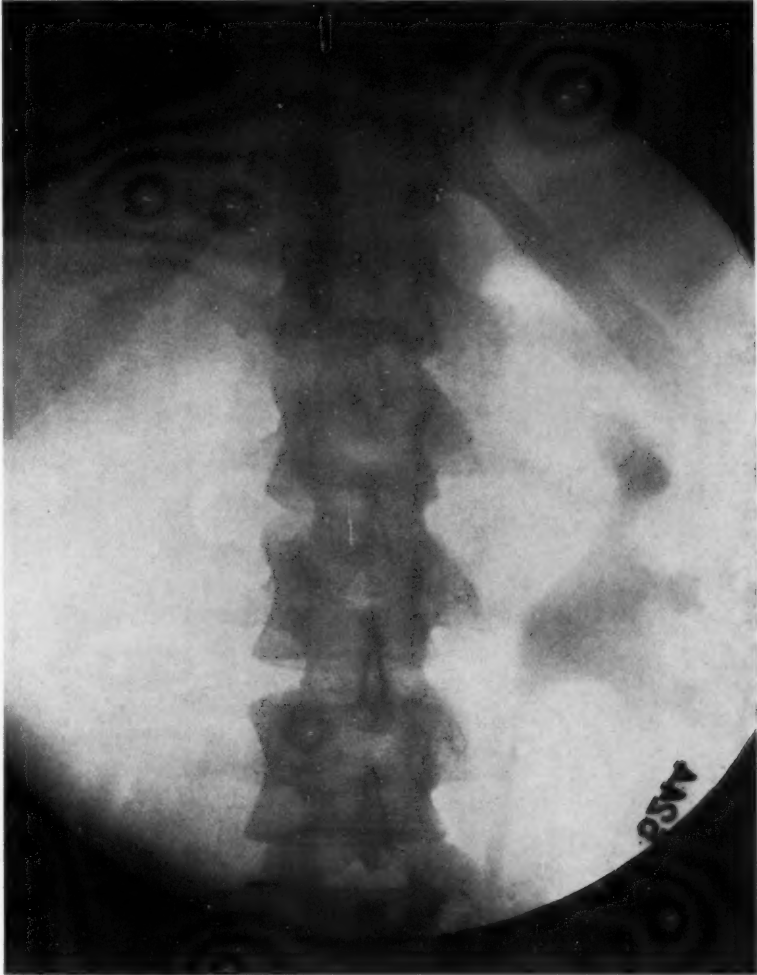


PLATE 16.



PLATE 17.

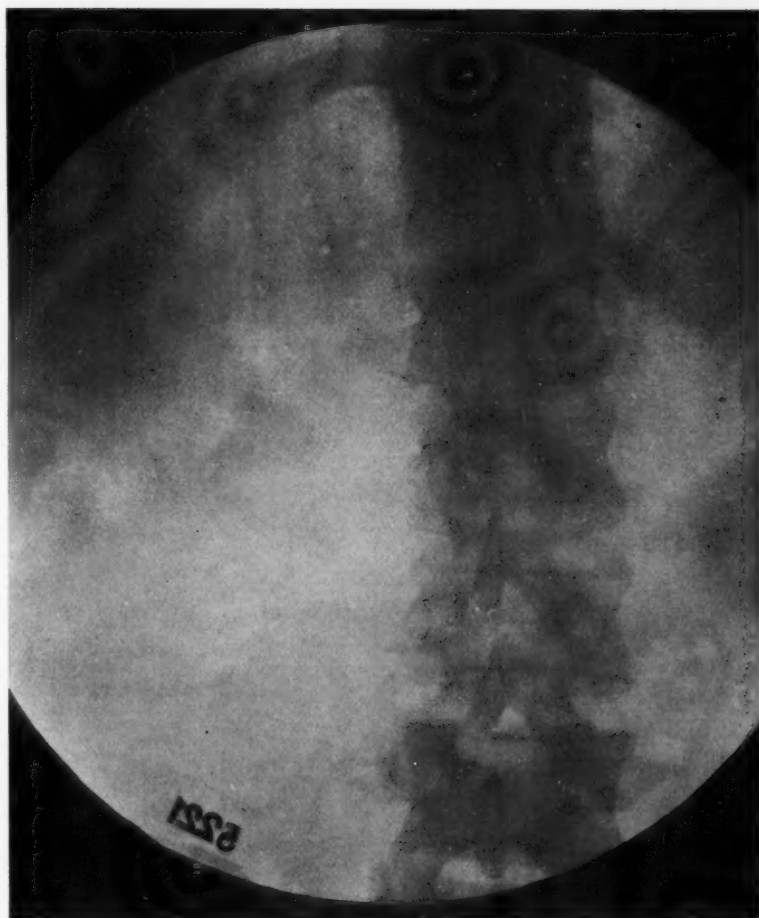
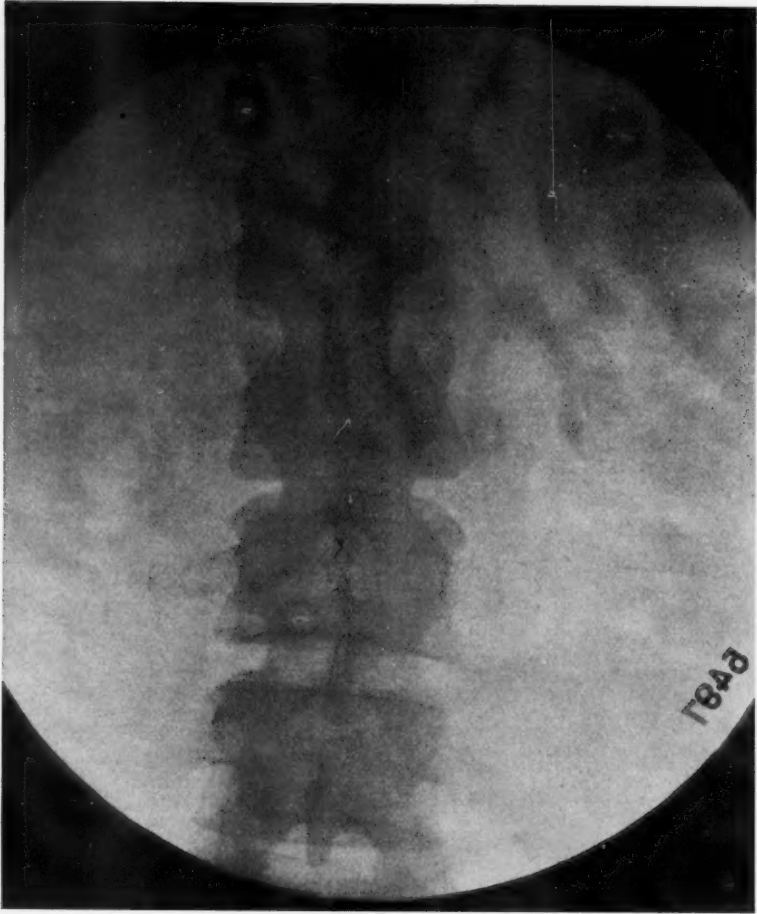


PLATE 18.



ANGIOMA OF PAPILLÆ OF THE KIDNEY.

REPORT OF THREE CASES OF PERSISTENT HÆMATURIA RELIEVED BY
CONSERVATIVE OPERATION.

BY GRANVILLE MACGOWAN, M.D.,

OF LOS ANGELES, CAL.

My attention was first called to this condition as a source of continuous and very exhaustive painless hæmaturia by the report of Hurry Fenwick, in "Obscure Diseases of the Kidney," 1903, of six analogous cases. I have adopted a different, and it seems to me, more precise method of operating. In his first two cases he opened the pelvis of the kidney, and having the good fortune to find the diseased papilla presenting, removed it with a curette and thus effected a cure. In the third and sixth cases nephrectomy was resorted to, and in all probability the organ could have been saved in both of these if the procedure followed by me had been adopted. In the fourth and fifth cases the condition existed by inference only, as the pelvis was not opened and the operation consisted of a partial splitting of the kidney tissue in the lower pole and rather rough handling of the parts over the pelvis by the end of the finger,—so that truly the report includes only two cases in which the condition was actually known to exist before the organ was removed and in which a conservative operation was curative.

The only case of a similar nature I can find reported in this country is one by Hugh Cabot in the *American Journal of Medical Sciences* for January, 1909, and in this case nephrectomy also was resorted to.

The very interesting article by Pilcher, *ANNALS OF SURGERY*, May, 1909, deals rather with general renal varix than with the condition reported by Fenwick and myself.

In all three of my cases it will be noticed that the dis-

eased papillæ were in the upper pole of the kidney. In Fenwick's three they were in the lower pole, and from the procedure adopted in Cases IV and V he evidently thought that this was the only part of the kidney in which they might occur.

Hemorrhage from a kidney which is not the subject of chronic inflammatory change, and where therefore the pedicle is normal, is easily controlled by the pressure of a soft rubber catheter tied moderately tightly about the blood vessels,—and the splitting of the organ with a long, broad, sharp knife is neither difficult or dangerous. Opening the pelvis the whole length of the kidney is the only way in which a full inspection of the entire organ may be obtained. The closure of the pelvis and bringing together of the two cut surfaces of kidney tissue is not difficult and the results of these three cases in my hands have been entirely satisfactory, saving—in each instance—an organ which it would otherwise have been necessary to sacrifice. I therefore feel that I can recommend this procedure to others.

I was directly stimulated to this publication by the article of Dr. Cabot, and expect that my experience has not been unique in America.

I am far from being able to offer an explanation of the origin of this condition. The ureters were catheterized in two of these cases before operating, without benefit to the hemorrhage. I do not believe that injection of adrenalin into the renal pelvis could in any of them have given more than temporary relief, for the pathological condition present is well shown in the illustrations accompanying the reports of Fenwick and Cabot.

CASE I (August 17, 1904).—J. W. E., age 48, married. An active business man. Had a mild attack of gonorrhœa at 40. Health has been good until four months ago when he began to have a feeling of lameness across the back and a dragging sensation in the left loin. Coincidentally he noticed his urine was tinged with blood. The hæmaturia has steadily increased and there have been a number of attacks of kidney colic coinciding with the

passage of long strings of blood-clot, but none of them have been excessively severe.

Urine, acid; specific gravity, 1020; contains much blood and some pus. Endoscopic examination shows the urethra to be healthy. Cystoscopic examination: mucous membrane of the bladder healthy; both ureteral mouths somewhat larger than usual, the left crater-like, and from this comes blood-stained urine. Urine from the right ureter normal. X-ray photograph of the left kidney and ureter shows an indefinite shadow in the lower pole of the kidney.

August 20, 1904: Nephrotomy through a posterior incision. The organ was freed with a little difficulty, as there was some adhesion at the upper pole. It was a rather large and good-looking kidney. Knowing from experience how utterly useless the procedure of needling a kidney is, I made a careful section of it extending through both poles and laying open all the calices. In the lowest calyx, which was opened first, a few grains of very fine sand were found, and there were a few also in the ureter; but the mucous membrane was not eroded or ulcerated and did not bleed. In the upper calyx there was one pyramid which was dark red, almost purple, from which blood oozed continuously. Its surface was not eroded and there were no granulations upon it. It differed only from the other pyramids by the epithelium seeming to have lost its natural sheen, and by the whole pyramid having the appearance of a "staunghshyperæmie." As this was evidently the source of the hemorrhage, and seeing no other way to stop it, I cut out the pyramid with a wedge-shaped incision and brought the edges together with two layers of catgut. The kidney was closed with two layers of mattress sutures and a continuous suture for the capsule. The wound was drained. Recovery was slow but complete. The delay was occasioned by inexperience. I used chromicized catgut to bring the cut edges of the pyramid together and for the mattress sutures also, tying one of the first row of the latter directly over the former suture, to obtain more pressure. The result was a slough which it took four weeks to separate and four more to heal.

The man has remained well ever since. Microscopical examination of this piece of kidney showed nothing but hyperplasia of the blood-vessels.

CASE II (January 29, 1907).—O. A. C., 45 years old; printer;

patient of Dr. Hamman. Two weeks previous he was attacked with a symptomless hæmaturia, which has been continuous and extremely severe. Cystoscopic examination shows a healthy bladder, and emission of blood from the left ureter.

January 21: Examination of the kidney and ureter through an S-shaped incision in the loin. As no clots could be seen coming down the ureter when it was rolled up on the peritoneum, it was opened and explored toward the bladder while a small catheter was passed up to the pelvis of the kidney. No obstruction was felt in the pelvic part of the ureter and the water used to flush the tube was not stained with blood as it issued from the catheter in the bladder. A very few drops of blood came from the catheter in the kidney. The kidney was brought out upon the side, split open from pole to pole and its calices with its pyramids examined closely. Everything was normal except a portion of one papilla in the upper pole, this was dark purple in color and bled continuously. It was removed by a wedge-shaped incision, the sides were united by one stitch of fine catgut. The incision in the ureter was closed over a catheter which was withdrawn through the pelvis of the kidney. The mucous membrane of the pelvis was approximated by a few fine interrupted catgut sutures, the two sides of the kidney were brought together with a double row of mattress sutures, tied loosely, and the wound drained by two ample cigarette drains which were withdrawn in two and four days respectively. Recovery uneventful and complete; he is now well.

CASE III (August 21, 1908).—Mrs. C., 39 years old, married; sent to me by Dr. Sheppard of The Needles, Cal.

She is a small woman who normally weighs about 130 pounds. Up to the latter part of March, 1908, she has always been robust. During an illness of her husband she strained her back in lifting him, and had to lie abed four days. Then she became constipated and has remained so. At intervals she has had some burning pain over the bladder vault, and the passage of urine has been at times painful. During the second week in May, a painless and profuse hæmaturia commenced and has continued ever since. Her appetite failed. She has lost fifty pounds in weight. She is very pale and not able to work. There is no history of tuberculosis and her heart and lungs are healthy.

August 24, 1908: Cystoscopic examination: Bladder healthy.

Bloody urine comes in jets from the left kidney. August 25: Right ureter catheterized. Specimen obtained, acid, specific gravity 1010, contained a trace of albumin but no blood or pus. This examination was followed by great pain and prostration.

August 27: Left ureter catheterized and pelvis of kidney irrigated with decinormal salt solution. This was followed by severe colic which lasted for six hours. Examination of specimen of urine for T. B. negative.

A blood count showed a rather marked grade of simple anæmia. It was thought best to attempt to control the hemorrhage medically. Peptomanganate of iron, hamamelis, ergot and adrenalin, and calcium chloride were all used. Her strength improved by the rest, which lasted until early in October. Her weight had fallen to 113½ pounds and the hemorrhage continued uninfluenced and unabated.

October 5: Nephrotomy. The kidney was lifted out upon the back and appeared to be normal. I then incised it carefully from pole to pole, opening the entire pelvis and exposing all of the calices successively, examining each papilla carefully. The two last papillæ at the upper end of the upper pole were seen to be covered with a moss-like membrane which bled continuously, just as water seeps through the cemented surface of a tunnel, back of which lies a spring. I cut out both of these papillæ with wedge-shaped incisions and endeavored to draw the edges together with No. 00 catgut, with a needle of corresponding fineness, but the kidney substance was too friable, and so I burned the raw base of both wounds lightly with an electric cautery. The mucous membrane of the entire pelvis was united by a continuous suture of fine catgut. The two cut surfaces of the kidney were united by two layers of mattress sutures, and the capsule sewed up with a continuous suture of fine catgut. There was very little bleeding. A cigarette drain was left in the wound for three days, when, there being no further escape of urine, the drain was removed. She left the hospital healed and well on October 22. There has never been any hæmaturia from the time of operation. The woman is well and weighs now 130 pounds.

Report of the pathologist, Dr. Leonard.—"The specimen submitted proves to be an increase in the fibrous tissue elements of the papillæ. The collecting tubules are greatly dilated and desquamation of the lining epithelium marked. The blood-vessels are engorged and dilated and their walls thinned."

**COMBINED CYSTOSCOPIC AND RONTGENO-
GRAPHIC EXAMINATION OF THE
KIDNEYS AND URETER.**

**BY ALEXANDER A. UHLE, M.D., GEORGE E. PFAHLER, M.D.,
WILLIAM H. MACKINNEY, M.D., and ALBERT G.
MILLER, M.D.,**

OF PHILADELPHIA.

THERE is no group of organs in which methods of precision in diagnosis are more successfully employed than in surgical conditions of the urinary organs. It is indeed surprising what progress has been made in the diagnosis of surgical affections of the kidney, ureter and bladder. The physician who avails himself of the knowledge obtained from a systematic employment of these methods approaches his work with a more accurate knowledge of the pathological conditions and surgical indications than is obtainable in any other field of abdominal surgery.

The chief methods of precision used in the diagnosis of the surgical affections of these organs are the X-ray, the cystoscope and ureteral catheterization.

The X-ray has its greatest field of usefulness in the diagnosis of calculus of the kidney and ureter. Here there is more than one source of error. In a very small proportion of cases a calculus may exist, and a shadow cannot be discerned; again shadows occurring in the region of the kidney or ureter may be caused by other conditions and consequently be misinterpreted. The shadows which must be differentiated from that of stone are those produced by (1) phleboliths; (2) fecal concretions; (3) enteroliths in the vermiform appendix; (4) calcified costal cartilage; (5) osteoplaques; (6) folds of the intestines; (7) foreign bodies in the intestine (pills, tablets, Murphy button, etc.); (8) calcified arteries;

* Read before the Philadelphia Academy of Surgery, January 3, 1910.

(9) calcified lymphatic glands; (10) bullets or shot in the muscles of the back; (11) prostatic calculi; (12) fingermarks on the plates; (13) developing errors, from an uneven flow of the developer; (14) flaws in the plate; (15) tubercular kidney; (16) calcified myomata; (17) extra-uterine pregnancy; (18) dermoid cyst; (19) calcified ovary; (20) moles on the skin. Shadows are also obtained in hydronephrosis, pyonephrosis, and tumor of the kidney, but a correct interpretation is usually impossible.

Cystoscopic examination frequently reveals pathological changes which are characteristic of ureteral or kidney disease. The character of the bladder mucosa, the presence of ulceration particularly around the orifices of the ureters, the condition of the ureteral openings themselves, whether elevated, depressed, inflamed, œdematous, etc., together with their functioning characteristics, and, finally, the character of the fluid ejected (clear urine, blood or pus) are valuable data which aid in establishing a diagnosis.

Ureteral catheterization will determine an obstruction in the course of the ureter, the urine collected will give information as regards the presence of abnormal elements such as blood or pus. The manner of the flow will determine to some extent the functional activity of the kidney or the presence of residual urine in the pelvis of the kidney, such as occurs in hydronephrosis or pyonephrosis.

While ureteral catheters will determine the presence of an obstruction, it is frequently impossible to establish the nature of the obstruction. The passage of a catheter may be obstructed by a calculus, a fold of mucous membrane or diverticulum within the ureter, a stricture or twist of the ureter or pressure upon the ureter from without. Attempts have been made to determine the presence of stone by the use of wax-tip catheters or catheters fitted with a stylet and stethoscope attachment. These methods are often successfully employed in the female by using the cystoscopic tube, but in the male where more complex instruments are necessary their use is difficult and uncertain. The X-ray furnishes the

most reliable information regarding the presence or absence of stone, but occasionally a mistake in interpretation is possible, because of the confusing shadows mentioned above.

It is impossible that any one person can become thoroughly skilled in all methods of examination, and the usual practice of having separate examinations made by the cystoscopist and the Röntgenologist in the diagnosis of surgical conditions of the urinary tract is to be commended, especially as the examination made by one will aid the findings of the other. In many obscure or doubtful cases better results will be obtained by combining the Röntgen examination with ureteral catheterization or exploration, using for this purpose a catheter filled with a substance capable of casting a shadow. To facilitate the examination it is best conducted upon the table of the X-ray laboratory, the picture being taken immediately after the catheters have been introduced.

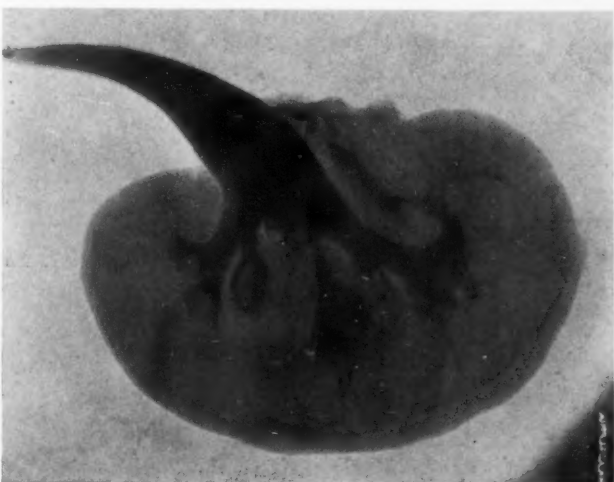
Catheters suitable for this purpose may be obtained by filling the lumen with bismuth paste, metal stylets or fluids of sufficient density to cast a shadow. Our first examinations were made with catheters filled with 30 per cent. bismuth paste. The ends of the catheters were plugged and the paste allowed to dry in the catheter. Flexible lead wire introduced into a catheter gives a more distinct shadow. Both of these catheters are flexible and can be employed without fear of injuring the walls of the ureter, when gently passed. We later found that fluid injected into the pelvis of the kidney for renal diagnosis was of sufficient density to cast a shadow not only of the kidney pelvis, but also the ureter. Where a stone is suspected a more distinct picture is obtained with the lead catheter introduced to the point of obstruction. It is not advisable to withdraw the cystoscope during the X-ray examination, especially if the obstruction exists within three or four inches of the ureteral opening, as manipulation of the instrument may displace the catheter. The site of obstruction can be estimated by graduated catheters or by measuring the distance which the catheter must be withdrawn before it emerges at the ureteral orifice.

FIG. 1.



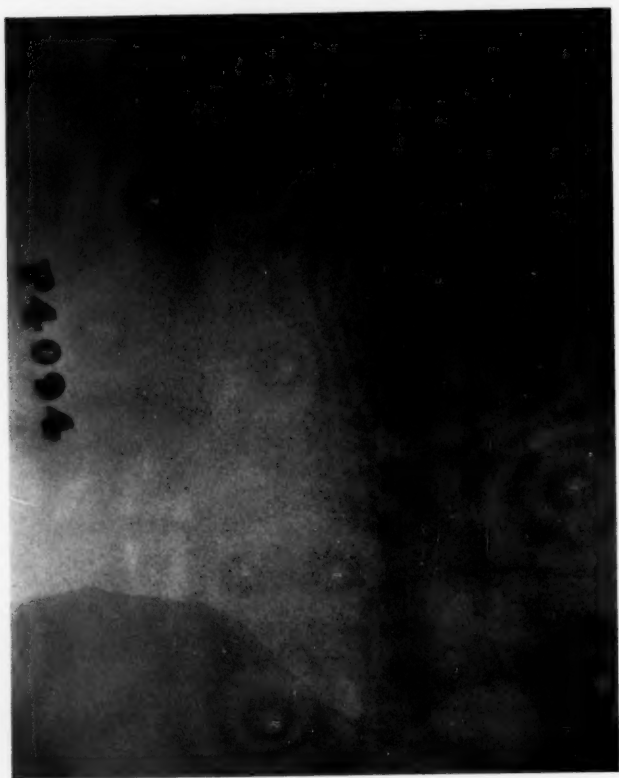
Shows normal pelvis of kidney injected by colloidal silver. (Post mortem.)

FIG. 2.



Shows some dilatation of the pelvis of the kidney, with infiltration of the tubules from a case of chronic interstitial nephritis.—Colloidal silver. (Post mortem.)

FIG. 3.



Shows the normal ureter and pelvis of the kidney injected, in a healthy adult, with colloidal silver (50 per cent. solution).

FIG. 4.



Shows a very tortuous ureter, with a bismuth catheter in position. Shows phleboliths in the pelvis, one lying directly beneath the ureter. (The upper part of the shadow of the catheter has been made more distinct by pencil.)

RADIOGRAPHIC EXAMINATION OF THE INJECTED KIDNEY
PELVIS.

Before resorting to this means of examination in the diagnosis of surgical affections of the kidney numerous fluids of different strengths were X-rayed to determine the density of their shadows. The percentages of the fluids were selected in accordance with their physical properties and the strength with which they could be used with safety. Among the solutions employed were emulsion silver iodide 5 per cent., novargan 10 per cent., silver nitrate 1 per cent., collargarum 2 per cent. and 10 per cent., and colloidal silver oxide 5 to 50 per cent. Colloidal silver oxide is a silver salt said to contain 50 per cent. of silver, sold under the name cargentos. This salt in 50 per cent. solution gave the most dense shadow. A further test of this solution was made by injecting it into the ureter and pelvis of the kidney removed at postmortem. Before injecting this salt into the pelvis of the kidney of any patient it was used extensively in urethral and bladder affections and was found nonirritating in 50 per cent. strength. The first two patients examined by this means received an injection of warm 20 per cent. solution of colloidal silver, but the X-ray plates were unsatisfactory as the shadows were too indefinite. All the other patients have received an injection of 50 per cent. strength.

The solution was injected through an ureteral catheter by means of a syringe of 10 c.c. capacity. Two patients received 10 c.c. each, and the solution flowed back into the bladder alongside the catheter. In these patients probably too much solution was used. The quantity of solution employed was subsequently reduced to 5 c.c., which was found satisfactory from a radiographic point of view. The injections were given slowly so as not to cause sudden distention of the kidney pelvis, a condition which will provoke renal colic. Injections immediately preceded the taking of the X-ray picture. The fluid was allowed to drain from the kidney pelvis before withdrawing the catheter, although subsequent experience has shown that this is not necessary.

Two of the patients who received an injection, suffered immediately from renal colic lasting for several hours after the fluid was injected. Both of those patients were highly neurotic and complained of vague urinary symptoms with pain referred to the kidney region, but in whom no evidence of disease could be found. One of these patients received an injection of 10 c.c. of 20 per cent. colloidal silver, the other 8 c.c. of a 50 per cent. solution into the right kidney pelvis with no discomfort; but a few days later, when the left kidney was injected with 4 c.c. of a 50 per cent. solution colic followed immediately. Later experience has convinced us that the colic is not due to any irritating properties of the solution, but to an overdistention of the kidney pelvis.

It is difficult to estimate the capacity of the kidney pelvis and to know how much of the solution should be injected without causing overdistention. The normal average capacity from our investigations is 4 to 6 c.c., but in pathological conditions it may be less than this or considerably more than even 200 c.c.

To prevent overdistention or the too rapid distention which cannot be controlled with the hand syringe, a difficulty encountered in the first five examinations, we have devised the following technic:

INJECTION OF THE URETERS BY GRAVITY.

The buttocks of the patient are elevated and the ureteral catheter is introduced for a distance of about three inches. The warmed solution is allowed to flow by gravity from a graduated burette, which is connected with the ureteral catheter by means of a rubber tubing to which is attached a small cannula. Then with a force of gravity of about two feet the fluid is allowed to flow. The solution flows at times evenly and at other times intermittently, but finally it comes to a standstill, which is taken as an indication of complete filling of the ureter and pelvis of the kidney.

This technic offers an advantage of a natural filling of the kidney pelvis and obviates the danger of overdistention or too

sudden distention. It also gives a possibility of filling a ureter which offers obstruction to the passage of a catheter but in which the obstruction is only partial as is seen by the flow of urine, pus or blood from the ureter before the introduction of the catheter.

By this means we may be able to determine the condition of the ureter, such as dilatation or diverticulation above a partial obstruction, together with the size of the kidney pelvis.

The fluid can then be easily drained from the ureter by the catheter, or it may be allowed to flow into the bladder. An additional quantity of the fluid can then be injected into the bladder and this organ outlined. This is useful in a suspected diverticulation or partial displacement from pressure.

Conclusions that can be made from the examinations thus far conducted are:

1. Combined X-ray examination and ureteral catheterization with catheters filled with substances capable of casting a shadow give more definite information as to the existence of ureteral obstructions than either method alone.

2. Doubtful shadows in the region of the ureters caused by conditions other than calculus can be excluded by this means of examination.

3. By the use of a warm solution of colloidal silver oxide (50 per cent.) a definite shadow of both ureter and kidney pelvis can be obtained.

4. This salt is non-irritating.

5. Renal colic does not occur if the solution is allowed to flow into the renal pelvis under low pressure.

6. Colic is probably due to too rapid injection of fluid or overdistention of the kidney pelvis.

7. This method of examination determines the size of the kidney pelvis, the amount of destruction of the kidney substance and the position of the kidney in its relation to other structures.

8. It also determines the position and alterations in the size and shape of the ureter and the bladder.

THE TREATMENT OF SYPHILIS BY HYPODERMIC INJECTIONS OF SALICYLATE OF MERCURY.*

BY MACY BROOKS, M.D.,
OF PHILADELPHIA.

IN treating syphilis we are confronted with two great difficulties: First, to keep the patient from blowing his brains out when informed of the nature of his malady; and, second, a much more difficult task, to keep him on regular treatment after all the subjective symptoms have disappeared and he is apparently perfectly well.

Is there any wonder that the dispensary and hospital cases proclaim themselves cured and throw away their medicine, when the refined and educated gentleman grows lax, indifferent and intermittent in his treatment and often goes so far as to marry contrary to advice, after a year or a year and a half of spasmodic medication.

Any method which by its prompt and rapid relief of all acute secondary symptoms, and by the fact that it makes it necessary for the patient to see the physician every five or ten days, is bound to impress the syphilitic with the importance of the disease and the necessity of regular treatment.

Few patients will make visits daily or every second day, as is necessary with the soluble salts, unless there is some subjective symptom which is worrying them, but the majority prefer to receive a hypodermic every five to ten days, as is required in this treatment, to taking medicine three or four times daily for several years, in constant dread of detection, or to rubbing in inunctions for twenty minutes once or twice daily and having their clothing and bed linen stained continuously.

The injection of the insoluble salicylate of mercury, if performed, as will be explained, is practically a painless pro-

* Read before the Philadelphia Academy of Surgery, January 3, 1910.

cedure. There is established a medical depot which is continuously dispensing mercury day and night as the tissues gradually change the insoluble salt into a soluble mercury.

The physician cannot be misled as to the amount of mercury the patient is getting and the patient cannot become lax in his treatment without the physician knowing it.

I was surprised when I first started this method of treatment to find how pleased were all my private patients, who had previously been on pills, to take it up and continue it.

The injections are continued all through the treatment even after the iodide has been started.

I believe from what I have seen of this treatment in my own practice and in the wards of the Philadelphia Hospital, that it is far superior to any, except inunctions in the hands of an experienced masseur, which is not practical in the vast majority of cases.

The rash, the headache, the angina, the osteocopic pains, the mucous patch, the alopecia and the condylomata rapidly disappear, and are seldom seen again if this treatment is continued. There have been no relapses in any of my private cases.

The solution which is used is composed of mercury salicylate, Mercks, 1 part, liquid albolene, 5 parts. One minim of this solution will equal one-fifth of a grain of mercury. This solution may be placed in one ounce bottles which are corked with sterile cotton, and placed in a water bath, the temperature gradually being raised to the boiling point and kept there for an hour. These bottles may then be corked with sterile corks, the necks dipped in paraffine, ready to open when needed. After once being sterilized the solution appears to remain so.

Dr. Gottheil told me he had left a bottle of this solution uncorked in his office for several months and after repeated attempts the bacteriologists had been unable to grow a culture from the exposed top of the media.

Liquid albolene will not become rancid, as will the vegetable oils and it is in no way irritating. It passes readily through

the needle, yet is heavy enough to hold the mercury in suspension for several minutes. It is unaltered by the regular means of sterilization.

It is advisable to have a special syringe having a long narrow barrel, so that the markings indicating minims are not too close together. With an oily menstruum it is difficult to measure a minim accurately in an ordinary closely marked hypodermic. All parts of the syringe, other than the barrel, should be of metal, so that it shall be as heavy as possible, to facilitate a quick deep puncture with the long needle. The needles vary in length from an inch and a half to an inch and three-quarters, depending upon the thickness of the patient's buttocks. The needles should be made to slip on to the syringe, instead of screwing on, so that the barrel of the syringe may be readily disconnected from the needle without disturbing the point, as is apt to occur when the barrel has to be unscrewed. The needle must have a larger lumen than the ordinary hypodermic needle to permit the passage of an oily fluid; a separate needle is kept for each patient.

The salicylate of mercury has no action on metal except to preserve its lustre and prevent oxydizing.

The best syringe is one designed by Dr. Gottheil; it has a plain metal piston which completely fills the barrel of the syringe, leaving no dead space when at the end of its stroke. The thumb end of the piston terminates in a flattened disk large enough to support the syringe with needle attached in a perpendicular position, so that no contamination may take place after sterilization.

The technic of the injections is very simple. After the syringe has once been sterilized the film of mercury which remains in the barrel keeps it sterile. The needle end of the syringe is wiped off with ether on cotton; it is then passed back and forth through the flame of a spirit lamp, five or six times, so that the solution may not be contaminated. It is now filled with the salicylate of mercury solution, which has previously been well shaken, and the needle being fitted in place is drawn through the flame several times. Care must

be taken not to heat the needle hot enough to take the temper out of it.

The syringe now being filled and all air expelled, is ready for use. The patient stands in front of the operator in the position of "attention," feet together, body erect and with buttocks relaxed. The skin is sterilized with a pledget of cotton wet with ether. This also chills the skin and renders it anæsthetic. This anæsthesia may be increased by blowing upon the ether-moistened skin. When the skin is quite cold the needle is driven home with a rapid stroke into the fullest part of the buttock on a line perpendicular to the intergluteal fold and one inch to one and one-half inch external to it.

The syringe is disconnected and the end of the needle watched for twenty seconds. Should the injection fluid start to well out, the needle is in a small vein; where the vein is large the fluid is followed by drops of blood. In either event the needle must be withdrawn and re-inserted. This may be done immediately, or, should the patient be nervous, it may be postponed. When the needle is found to be properly inserted, the barrel is again attached and the injection fluid slowly introduced. The needle is then rapidly withdrawn, its track closed by rotating the tissues with a pledget of cotton. A square of sterile zinc oxide adhesive plaster is placed over the point of puncture. This may be removed in a few hours. Blood from the seat of puncture after withdrawal of the needle is of no consequence, simply indicating that a vein has been injured as the needle passed it; pressure for a moment will stop this. With this form of treatment, there is less tendency to salivation and gastro-intestinal disturbances, and the results are very rapid.

In ordinary cases, the headache, rash, and sore throat disappear after the first or second injection, and persistent cases are frequently relieved after three or four hypodermics.

It is well to start with a small dose at first, especially in women, except when there is a severe lesion requiring drastic measures.

In starting the treatment at the Philadelphia Hospital,

there were a number of cases which had been under other treatment for various periods, ranging from a month to eight months, some of which had been very refractory, having stubborn mucous patches and condylomata; most of these cleared up after two or three injections.

I have collected data on sixty cases, which I will not report here, except to state that they indicate a decided improvement over the methods previously used at the hospital.

Dr. Christian and I started this treatment last winter at the Philadelphia Hospital and the other chiefs upon the genito-urinary service have continued it as the routine treatment ever since, which would indicate that they were pleased with their results.

The advantages of this form of treatment are as follows:

All treatment is administered by the physician, therefore he can readily determine when a patient is neglecting treatment.

The history shows the exact amount of mercury the patient is getting, which is very important in determining results, as few patients are regular with treatment by mouth or inunctions.

A visit every five to ten days to a doctor's office does not arouse suspicion, and it relieves the man of affairs from the fear of detection in constantly taking medicine and the danger of forgetting it.

Simplicity of technic—flaming, instead of boiling, being all that is required.

The injection, if properly given, is practically painless, causing a slight bruised sensation which usually disappears in twenty-four hours.

These points of advantage, coupled with the fact that this method seems to give the most rapid results, even in very stubborn cases, should recommend it to those who have not yet used it.

PLASTIC OPERATION FOR THE RELIEF OF AN INCURVATION OF THE PENIS.*

BY ORVILLE HORWITZ, M.D.,

OF PHILADELPHIA.

Professor of Genito-Urinary Surgery in the Jefferson Medical College; Surgeon to the Jefferson Hospital, and to the Pennsylvania State Hospital for the Insane.

THE case here cited is unique; hence it is believed that a brief description will not prove uninteresting.

The patient, a man thirty-six years of age, consulted me in March of the past year for a physical defect of ten years' standing that followed an operation performed for stricture of the urethra. His recovery from the operation had been uneventful, but it was soon after observed that when the organ became erect, it was bent at almost a right angle in the median line, and was deflected toward the right side. The deformity made coition impossible. Previous to consulting me he had undergone various treatments at the hands of numerous physicians, but had obtained no relief.

On inspection, the flaccid penis presented a normal appearance. Palpation revealed the presence of a fibrous mass, one and one-half inches long, situated on the under surface of the penis, at the right side of the urethra. The mass appeared to lie between the sheaths of the corpus cavernosum and corpus spongiosum, and to be attached to the lateral wall of the canal. On introducing a bougie the tube was found to be free from obstruction. The position and attachment of the cicatricial tissue made it evident that it could be resected with little or no damage to the body of the organ; hence a plastic operation, which would, in all probability, result in benefit, if not in cure, was deemed justifiable. My colleague, Dr. Loux, who saw the case in consultation, agreed with my conclusions.

The patient was told that his only hope of obtaining relief lay in an operation that would be experimental in character. He was further assured that if it was found that the fibrous mass

* Read before the Philadelphia Academy of Surgery, January 3, 1910.

could not be removed, nothing would be done, but that if we found the conditions favorable, we would proceed with the resection. We impressed upon him the fact that we could promise nothing; that the operation might fail, or might even result in accentuating the deformity. On the other hand, it was explained to him that if the operation proved successful, the result would be most gratifying, and the several functions of the organ would be completely restored.

The patient, an unusually intelligent man, agreed to have an operation performed.

At operation our previous views were confirmed, namely, that the fibrous tissue was interposed between the corpus cavernosum and corpus spongiosum. It was easily resected until the middle of the penile urethra was reached, this being the site at which the stricture had been incised. At this point the scar-tissue formed a part of the urethral canal. Its dissection necessarily resulted in a hole, about the size of the finger-nail, being left in the lateral wall of the urethra. In excising the fibrous tissue in the cavernous structure an incision was made through the sheath; an upper and a lower flap were then formed, thus giving access to the scar-tissue, which, fortunately, involved the body of the organ to only a slight degree, and was easily removed. The lower flap of the sheath of the corpus cavernosum was utilized to close the opening made in the wall of the urethra. The wound was then closed in the usual manner, and perineal drainage established by means of a perineal cystotomy.

Following the operation there was cedema of the penis, which persisted for about four days. The sutures and perineal drain were removed on the eighth day, when the patient left the hospital. When I saw him, about a week later, he stated that when the organ became turgid, the former curve in the median line had almost entirely disappeared, and that there was some slight deflection of the glans penis toward the right side. A month later coition was successfully effected.

In 1898 Otis, of New York, published a valuable contribution to the literature on the subject of stricture of the male urethra. In this work ("Stricture of the Male Urethra and its Radical Cure") he practically assumes that the urethra should be of "uniform calibre," at least as far down as the

triangular ligament. He states (*loc. cit.*, p. 22), moreover, that: "We may hence affirm, as a most important axiom, that the slightest encroachment upon the calibre of the urethral canal is sufficient to perpetuate a urethral discharge, or even, under favoring conditions, to establish it *de novo*, without venereal contact."

These views were received with favor by most surgeons, and thus dilating internal urethrotomy became the accepted method of treating cases of chronic anterior urethritis in whom the slightest suspicion of a coarctation of the urethra existed.

Otis also devised an ingenious instrument, known as a "urethrometer," which serves to determine the dilatability, location, and calibre of any constriction that may be present in the anterior urethra. This instrument is at present used only in the examination of certain obscure cases. In the hands of a surgeon of wide experience in urethral cases, and of one skilled in the manipulation of urethral instruments, the urethrometer is capable of disclosing valuable information. In the hands of those of limited experience in urethral work, however, it is unreliable, and may impart information from which erroneous conclusions regarding the existing local condition of the urethra may be drawn, and a mistaken diagnosis made; thus the patient may be subjected to a urethrotomy that was not only unnecessary, but probably injurious as well.

Many years ago Gross, in his "System of Surgery," emphasized the fact that but few physicians can manipulate urethral instruments skilfully. This writer goes on to say: "To be successful, it requires skill of the highest order and an intimate knowledge of the anatomy of the urethra. My conviction is, but few men can do it well."

It is now well understood that the calibre of the urethra is not uniform, but that the tube is made up of a series of physiologic dilatations and contractions. Its walls are in contact, except during the passage of urine or the emission of semen, or when the canal is distended by the introduction of instruments or other foreign bodies.

In reality, the urethra is a narrow slit, about eight and one-half inches long, the calibre of which is not fixed, but which, when normal, is capable of great distention, without consequent injury. The extent to which the canal can be dilated with safety varies in different individuals. Many years ago Otis demonstrated that the normal dilatability of the urethra bears practically a constant relation to the circumference of the flaccid penis at the penoscrotal junction.

When operating for the relief of a stricture, the surgeon is not concerned about the calibre of the canal, but aims to restore the normal function of dilatation and contraction to the tube, which function is always interfered with when a stricture exists. This result can be attained only by exercising care when dividing the constricting fibrous tissue that makes up the stricture, and by avoiding, so far as possible, inflicting injury to the healthy tissue in front of, behind, and surrounding the coarctation. If the healthy tissue surrounding the constriction is extensively incised, it will be found, on convalescence, that the normal power of contractibility and dilatability of this portion of the tube is permanently lost, and that a plastic exudate forms in the wounded healthy tissue and may become organized into fibrous tissue, which, in turn, contracts, causing an incurvation of the penis.

In the case previously cited, the instrument that caused the incurvation of the penis was one devised by Otis, and known as the "dilating internal urethrotome." The technic of the method of using this instrument is thus described by the inventor: "The normal dilatability of the urethra is first determined by means of the urethrometer. The urethrotome is then introduced beyond the stricture, and the blade separated up to one or two millimetres beyond the normal calibre of the urethra, in order to make the stricture completely salient; the blade of the instrument is then drawn through the entire mass of cicatricial tissue, severing the stricture completely" (Morrow, "Genito-Urinary Diseases," vol. i, p. 308).

The wide employment of this method of performing urethrotomy resulted in quite a large number of incurvations being

reported as a late sequel to this operation. My own unfortunate experience with two patients, coupled with the fact that incurvation of the penis was not an unusual complication of a dilating internal urethrotomy, led me to investigate, and finally to discover, the cause of this untoward result. This I found to be due to overdistention of the urethra when the stricture was incised. On performing the operation with the canal overdistended it was impossible, in some cases, to avoid wounding the surrounding healthy tissue, which, as has previously been pointed out, will cause the formation of cicatricial tissue and result in incurvation of the organ.

Since discovering the cause of this condition I have modified the method of using the Otis dilating urethrotome. The method as now employed by me is as follows: After the instrument has passed slightly beyond the stricture, the blades of the instrument are separated just widely enough to fill the calibre of the stricture comfortably, and not to overdistend the canal, so causing the stricture to become fixed and present an unyielding surface to the passage of the knife. Since adopting this technic I have used this instrument in a large number of cases without subsequent development of untoward results, and I have come to regard this form of urethrotome as one of the most satisfactory and reliable instruments that can be employed for performing internal urethrotomy.

The surgeon engaged in genito-urinary work has long since learned that a chronic anterior urethritis, associated with a stricture of large calibre, in the so-called recent or "succulent stage," is frequently associated with peri-urethral thickening, due to cell proliferation, that interferes materially with the dilatability of the urethra. In such cases he has discovered that better results are obtained by gradual dilatation, employing the conical steel bougie for this purpose, than by attempting urethrotomy.

The once highly lauded and popular method of treating such cases by internal urethrotomy has long since been abandoned, and, in consequence, incurvation of the penis resulting from this method of treatment is now but seldom encountered.

In concluding, let me warn the surgeon not to be carried away by the gratifying result that I was fortunate enough to obtain in the case cited, that he be not led to operate indiscriminately upon cases of this kind that may come under his care. In the past fifteen years I have seen several similar cases, but only in the one just recounted have I deemed operation justifiable. In the others the scar tissue was so extensively connected with the penile urethra and the corpus cavernosum that an extensive resection of the fibrous mass would have resulted in a hopeless mutilation of the body of the organ.

THE PRINCIPLE OF THE TEALE FLAP APPLIED TO AMPUTATION OF THE PENIS.

BY WILLIAM M. MASTIN, M.D.,

OF MOBILE, ALABAMA.

IN a case of carcinoma of the glans penis where amputation was performed, some ten years ago, the hæmorrhagic oozing from the corpora cavernosa was so persistent and troublesome—despite the use of numerous ligatures together with the application of the cautery, and, finally, only yielding to inversion and firm suture of the sheaths of the cavernous bodies—that I sought some modification of the usual operative technic by which this complication might be avoided or controlled.

It then occurred to me that this could be accomplished by the application of the principle of the Teale method of amputation of the extremities,—that is, by incising the cavernous structures horizontally, forming a long lower or posterior flap and bending this upward on itself, to be snugly sutured to the upper transversely divided end. It seemed probable that this would secure the necessary pressure hæmostasis, and, at the same time, produce a symmetrically fashioned stump.

With this idea in view, the following technical steps were evolved, and the completed operation has resulted so admirably in several instances that I venture to offer it as a very satisfactory method of performing partial amputation.

First Step.—With a constricting band encircling the base of the penis, the integumentary flap is formed either by a long anterior and short posterior oval flap, or by the antero-postero-rectangular Teale flaps—the anterior long flap corresponding in length approximately to one-half the circumference of the organ and the short posterior flap to one-fourth of this length. This character of flap is preferred to the circular cuff method, since the cutaneous scar is placed underneath and be-

hind the urethral outlet. The skin flaps are then freed and retracted.

Second Step.—The two cavernous bodies are now trans-fixed laterally by a narrow knife, somewhat in advance of the base of the skin flaps, and split down to the extent of giving the proper length to the proposed flap, at which point the edge of the knife is turned downwards and the lower segment, containing the corpus spongiosum, cut through. The upper segment is next divided transversely on a level with the point of the original entrance of the knife, thereby severing the remaining attachments of the diseased portion to be removed.

Third Step.—The spongy body enclosing the urethra is next dissected from its bed to the required distance; the vessels ligated with fine chromicized catgut; and the cavernous flap turned upward and sutured to the superior half of the corpora cavernosa. One or two lateral sutures give both additional support and greater security against bleeding.

Fourth Step.—Finally, the urethra is divided at an angle obliquely downwards, then split either laterally or on its dorsal surface, and stitched, in the ordinary manner, to a button-hole opening made in the anterior skin flap. The cutaneous flaps are approximated with interrupted sutures of horse hair or fine silkworm gut.

The hæmostasis is complete, and a shapely, well-rounded stump is formed. The line of skin union is posterior to and away from the urinary meatus. In addition, the urethra and cutaneous flaps are not in contact with the usually transversely divided cavernous stump, and, therefore, the urethral meatus has less tendency to become strictured and deeply depressed, or of an infundibular form, produced by the contracting cicatrix, as frequently occurs after the usual circular amputation.

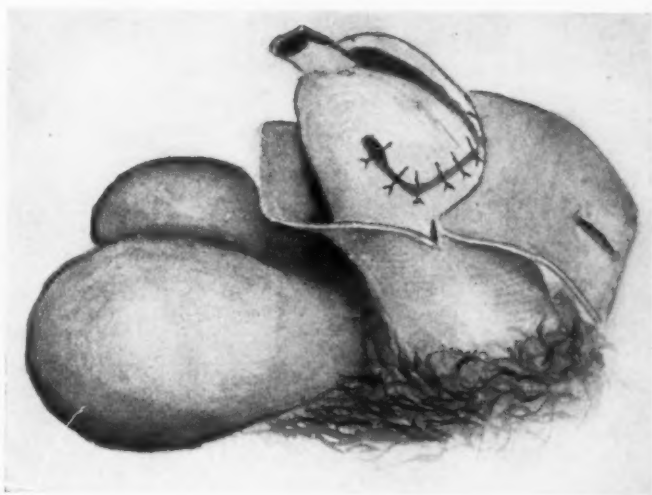
Another advantage, and which is possibly the most important feature of the operation, is that a more radical removal of diseased tissue, with a minimum of shortening of the organ, can be effected by this method. Observation has definitely shown that epitheliomatous disease of the penis oftener origi-

FIG. 1.



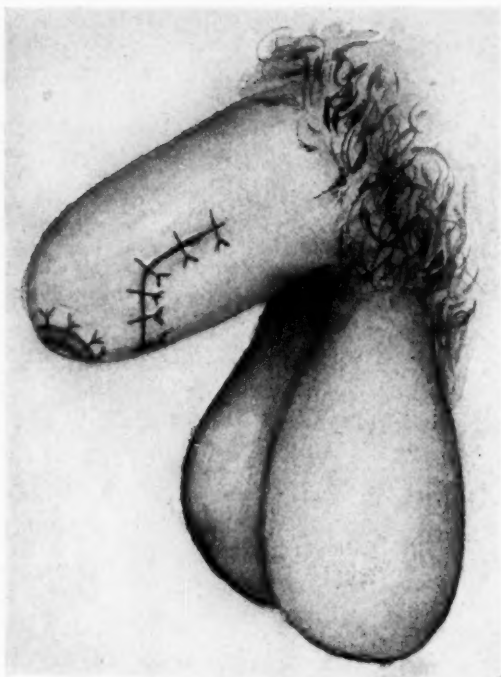
Showing the cutaneous and cavernous flaps formed.

FIG. 2.



Showing the urethra dissected loose and split dorsally, and the cavernous flaps sutured in place.

FIG. 3.



Showing the skin flaps sutured and the operation completed.

nates superficially about the corona glandis and the mucous surface of the prepuce than elsewhere on the organ, and that the route of extension is by way of the main lymphatic trunks occupying the dorsum. The lymphatic radicles of the anterior extremity of the penis largely converge to these large dorsal channels, which pass backward in the subcutaneous tissue, on both sides of the dorsal blood vessels, to empty into the lymph-nodes of the groin and pelvis. Consequently, by dividing the corpora cavernosa laterally and cutting away the upper halves—as far back as the pubis if necessary—the lymphatic ducts coming from the diseased area are in greater part removed; and the lower halves composing the flap, which are less rich in lymphatics, are utilized to give increased length to the stump. Furthermore, the bilateral skin incisions can be prolonged on either side into the inguinal regions, the upper skin flap reflected upward onto the pubis, and the dissection extended so as to include the groin glands, as in the operation practiced by Nicolls, of Glasgow (*vide ANNALS OF SURGERY*, February 1909, p. 240, *et seq.*). Again, on account of the lymphatic distribution to the dorsum of the penis, and the consequent greater danger of the cutaneous lymphatics in this locality being infected, the integumentary flaps can be reversed,—that is, taking the long flap from the under surface and the short flap from the dorsal aspect of the organ.

This procedure is, necessarily, restricted to the early stages of the disease where the neoplasm is limited to the glans or prepuce, and before infiltration of the spongy and cavernous bodies occurs—the dense fibrous sheaths of the latter resisting carcinomatous invasion until late in the progress of the disease—allowing sufficient sound tissue for safe utilization in the formation of the flaps.

Figs. 1, 2 and 3 indicate the several stages of the operation.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, held December 8, 1909.

The President, DR. ELLSWORTH ELIOT, JR., in the Chair.

SARCOMA, WITH MULTIPLE SKIN METASTASES.

DR. GEORGE D. STEWART presented a boy, 12 years old, whose family history was negative. His past history was also unimportant with the exception of the fact that the patient fell out of a hammock two years ago, striking on his back. No definite connection, however, could be traced between that injury and his present trouble.

About the middle of June, 1909, an abscess appeared over the left shoulder-blade. This opened spontaneously, but the opening was subsequently enlarged by the attending physician. The wound healed shortly after this, but before July 1, 1909, a lump about the size of a hickory-nut appeared in the patient's left axilla; this grew rapidly, and was not painful at first.

In August, 1909, when Dr. Stewart first saw the patient, he had a large tumor in the left axilla; this was tender, but not reddened. The boy's temperature at this time was 101; his pulse ranged between 100 and 114. A blood count showed 22,000 leucocytes, with 70 per cent. polymorphonuclears and 21 per cent. lymphocytes. The attending physician had regarded the tumor in the axilla as an abscess, but there was something in its appearance—its shape and color—as well as in the appearance of the patient himself that suggested sarcoma. However, as his temperature and leucocyte count continued, an incision was made into the axilla on August 14, and some friable tissue, probably swollen lymph-nodes, was removed; a certain amount of bloody grumous material, not distinctly purulent, escaped at the same time. The tissue was dark in color and more friable than liver tissue. It was submitted to Dr. Crowell of the Pathological

Laboratory of Bellevue Hospital, who reported that it consisted of partially organized inflammatory exudate. Microscopically, it showed an exudate of fibrin and polymorphonuclear leucocytes, with the formation of some young connective tissue cells and new blood-vessels. He pronounced the lesion an acute fibrinopurulent inflammation, with partial organization.

Despite this report, and despite the persistence of the leucocytes, Dr. Stewart said he still believed the case to be one of malignant disease. Accordingly, on August 29, 1909, the tissue already having begun to fungate, he enlarged the opening slightly and cleaned out several large masses, which separated easily from the fascial covering of the muscles bounding the axilla. Cultures were taken, and the tissue removed was kept warm and sent to the Pathological Laboratory. On this second specimen, Dr. Crowell reported as follows: "Further microscopic sections of the tissues from the axilla of this patient show it to be a sarcoma of the lymphoid type. It is very vascular, blood lying free in the interstices of the tissue." Cultures from the material taken at the time of the operation and in the laboratory were sterile.

From this time on the axilla continued to enlarge, the growth beginning to fungate through the incision, and soon afterwards the lymph-nodes in the opposite axilla began to enlarge. The boy's general health continued remarkably good, his temperature running up to about 100, and his pulse ranging between 80 and 100. In September a small growth appeared in the mid-axillary line, about the level of the ninth rib; this was irritated by the bandages and about the size and color of a purple plum, and since no melanosis had thus far appeared, it was at first supposed to be due to the irritation of these bandages; on further observation, however, it did not break down, and a small incision was made into it, the cut surface looking like a non-resolved blood clot. On October 11, 1909, the boy was submitted to Dr. John A. Fordyce, who suggested the possibility of sporotrichosis, but upon microscopical examination he agreed in the diagnosis of sarcoma, calling it a round-celled sarcoma. He suggested the use of arsenate of soda in increasing doses, and stated that the complete disappearance of the primary lesions of sarcoma of the skin was unusual.

On the following day the patient was seen by Dr. William B.

Coley, who regarded the prognosis as grave. The mixed toxins had already been administered to the patient, and Dr. Coley advised their continuation for two or three weeks longer. This was done, and the dose was gradually increased until sharp reactions, with a temperature of 103 to 104, followed. The treatment was continued for five or six weeks, but without noticeable restraint upon the size of the growth. Cultures from the axilla and smears made from the melanotic tumor were sterile. Coley's fluid was discontinued, but the arsenate of soda was kept up and pushed to the limit of tolerance, but it apparently had no effect on the growth. New tumors have recently appeared, including one large one covering the umbilicus, and several on the scalp and forearms.

After the appearance of a pigmented tumor on the opposite side, the scar of the so-called abscess was more closely examined. It was small, there were no irregularities in the skin, but close inspection showed slight pigmentation.

This case was interesting from several points of view, as follows: (1) It suggested, because of the primary abscess, the temperature and leucocytosis, an infection; (2) it was interesting to note that the first metastasis at any distance from the primary growth was apparently in a lymph-node; (3) the healing of the primary focus was unusual.

Dr. Stewart said that further examination of the pigmented tumors of the skin was necessary and would be made.

RECURRING TROPICAL ABSCESS OF THE LIVER.

DR. STEWART presented a man, who in August, 1906, went South to work in Georgia and Florida as a laborer. The following April he returned to New York. He had some bowel trouble and visited the Hudson Street Hospital, where a diagnosis of amœbic dysentery was made and he was transferred to Bellevue Hospital. Here he received irrigations, but remained only one day.

He returned to Bellevue on May 14, 1907, complaining of pain in the upper right quadrant of the abdomen and in the pit of the stomach. He also suffered from diarrhœa, with eight or nine stools daily, accompanied by cramp-like pains, tenesmus and weakness. Upon examination at this time, the liver was felt below the free margin of the ribs, the gall-bladder was palpable and tender, and there was abdominal rigidity. A diagnosis of chole-

cystitis was made, and on May 14 a cholecystectomy was done. The liver appeared to be congested; the gall-bladder was adherent and distended. When the patient left the hospital on June 24, 1907, his wound had healed and he was in good health, although his stools were still more frequent than normal.

About three weeks later he was re-admitted to the hospital, complaining of pain in the right shoulder and chest. His temperature was 103, and there were signs of fluid in the right chest. A thoracostomy was done, but no pus was found. His pulse and temperature slowly fell to normal, and the patient was discharged, improved, on August 4. He was re-admitted on the twenty-eighth, complaining of cough, with expectoration of thick, bloody mucus and signs of consolidation over the right lung. The sputum was sent to the laboratory, where it proved to be pus from the liver. The patient improved slowly, and left the hospital on September 20. He returned a month later complaining of cough, which was paroxysmal in character, and thick, bloody expectoration. His temperature on admission was 103; pulse, 120. He also suffered from diarrhoea and tenesmus. On January 1, 1908, a blood count showed 3,000,000 red blood cells and 44 per cent. of hæmoglobin. The liver was large, and gradually increasing in size. There was consolidation of the lower right lung. These symptoms persisted; the cough continued; the patient lost weight and showed a marked secondary anæmia. During this time, amœbæ were frequently demonstrated in the stools.

On February 8, 1908, the patient first came under Dr. Stewart's care. Under cocaine anæsthesia, Dr. Stewart removed an inch and three-quarters of the tenth rib on the right side, and after suturing the diaphragm to the parietal pleura, the diaphragm was opened just over the anterior fold of the coronary ligament and the abdominal cavity packed off. A needle was then introduced into the liver, locating an abscess, from which ten or twelve ounces of pus were evacuated. The abscess was drained, and subsequently suction was applied by Bier's cup method. Following this operation, the patient's cough rapidly ceased. By the middle of April his wound had healed completely, he had gained 45 pounds in weight, and his anæmia had markedly improved. His stools, however, were still frequent, in spite of repeated irrigations of silver nitrate and quinine solutions. On May 27, 1908, an appendicostomy was done, and by this route through-and-

through irrigations were continued until June 6, 1908, when he again began to suffer from a slight cough, with pinkish expectoration, and signs of consolidation in the right lower lobe posteriorly. At this time his stools were still frequent and the amœbæ were still present. The appendicostomy wound remained open. There was some resistance in the upper part of the abdomen. Temperature, pulse and respirations were normal.

From this time until January 16, 1909, the patient remained in the medical ward of the hospital receiving treatment for dysentery, first through the appendicostomy wound, and subsequently, when that closed, irrigations were again instituted through the rectum. The number of stools daily varied from two to eight, and the presence of amœbæ was demonstrated repeatedly. In the meantime his cough had increased in frequency and severity, and his pulse and temperature gradually rose. After a severe fit of coughing, he would often expectorate a large amount of pus, which would be followed by a decline in his pulse and temperature. The expectoration was typical, resembling anchovy sauce. There was a gradual increase in lung involvement, the dulness rising higher and higher. The liver was also increased in size. The patient again began to lose weight and strength and to develop secondary anæmia.

On January 16, 1909, he was again transferred to the surgical ward. At this time his general condition was poor. He had severe paroxysms of coughing, with free expectoration. His temperature ranged between 99 and 103; respirations, 24 to 30. He had from two to five stools daily, with cramp-like pains in the abdomen. Amœba were still present. There was dulness over the entire lower chest posteriorly, from the angle of the scapula downwards. The liver was much enlarged, occupying the entire right upper abdomen.

On February 15, 1909, under cocaine, an incision was made over the eighth rib posteriorly. An aspirating needle which was introduced seemed to enter dense fibrous tissue, and no abscess was located. The needle puncture was enlarged with dressing forceps and a tube was inserted through which some bile and a little pus escaped. Ten days later this wound was enlarged and the liver explored in all directions. A tube was again inserted, which discharged considerable pus and some bile. The patient's cough was not relieved, and he showed but little improvement.

On April 20, 1909, the dulness posteriorly extended above the angle of the scapula. A needle was thrust through the sixth intercostal space, and typical anchovy sauce pus obtained. Under cocaine, a portion of the sixth rib was resected, and about twelve ounces of thick pus evacuated. A drainage tube was left in the wound, which discharged freely. Within two weeks after this operation the patient's cough and expectoration had entirely ceased. In August the drainage was discontinued, and the sinus closed. Rectal irrigations were still continued, and the stools varied in number from one to eight daily. *Amœba* could still be demonstrated in the stools at the present time. The patient's pulmonary condition continued to improve; the lung had expanded, there was no cough, and the breathing sounds could now be heard almost to the base of the right lung. The liver was still enlarged. The patient still suffered from abdominal distention and pain.

This case, Dr. Stewart said, illustrated the persistence of the *amœbæ*, and the futility of all remedies directed against them, irrigations both through the rectum and through the appendicostomy wound having been equally useless. It had been found that the easiest way of obtaining the *amœba* was to pass a rectal tube, leaving it in from a few minutes to half an hour, and upon its withdrawal, the *amœba* were on the summit of the tube.

The case also illustrated the fact that when an abscess of the liver had perforated into the lung, the spontaneous opening was rarely adequate for drainage, and more efficient drainage should be instituted elsewhere. This was usually difficult to accomplish, and in making the attempt one should remember that the rupture generally took place from the highest part of the liver; that is, it opened into the liver nearer the posterior than the anterior surface. Keeping this fact in mind would help in the guidance of the exploring needle, and it would also help to determine one to choose the transpleural route, which he believed to be the proper one in nearly every case of solitary liver abscess. When the enlargement was upwards, as it frequently was, drainage from behind was more satisfactory and rational than from in front, and when there was no enlargement downwards, drainage from in front was difficult, and might be dangerous. When an exploratory laparotomy had been performed, one could select the spot

where there were adhesions or a pointing abscess: after the rib had been removed the diaphragm might be pressed from below into the wound, sutured there, and adhesions might be waited for; or, if present, the liver might be at once exposed. If no abdominal wound was made, the liver might be explored after the careful resection of a rib, suturing the two layers of pleura and opening the diaphragm, with or without waiting for adhesions.

The use of cocaine was to be commended in these operations, there is little pain, as the liver is not very sensitive. With a general anæsthetic, this patient would probably have been drowned in pus.

MESENTERIC CYST IN A CHILD.

DR. WILLIAM B. COLEY presented a boy, ten years old, who came under the speaker's observation seven weeks ago. Upon examination, the abdomen presented a tumor about the size of an adult head. It appears to be cystic in character, and could be differentiated from ascites by careful palpation and change of position. By exclusion, Dr. Coley said, he made a diagnosis of probable mesenteric cyst, although he had never seen one before. Upon operation, he found a cyst containing material of a dark reddish-brown color. This was submitted to Dr. Frederic E. Sondern for analysis, who reported as follows:

The fluid has a brownish red color, no odor, an alkaline reaction, specific gravity 102.2, with pronounced deposit. No coagulum, and is not tenacious. Albuminoid substances 4.2 per cent. by weight; sodium chloride 1.8 per cent. Sugar and urea are not present. The microscopic examination of the sediment shows chiefly blood, with considerable cholesterolin, some granular corpuscles, and epithelial cells, some of which are fatty. Cyst count: Lymphocytes 44 per cent.; polynuclear cells 56 per cent.; micro-organisms were not found.

The cyst apparently originated in the mesentery of the jejunum. In order to resect it, it would have been necessary to remove about two feet of small intestine, but by cutting through the peritoneal coat of about two inches of gut and peeling it backward, he finally succeeded in enucleating the entire cyst. He then restored the peritoneal coating and closed it without leaving a raw surface. The wound was closed without drainage. The boy made a perfectly good recovery and left the hospital at

the end of two weeks. The operation was completed in about forty minutes.

Dr. Coley, after referring to the rarity of these cases, stated that in this instance it had been regarded as a malignant growth, and it was with that diagnosis that the patient had been referred to him. The cases were still so few in number that no definite rule of operative procedure could be applied to them. When Dr. Charles N. Dowd reported his case to the Society in 1900, there were about 136 cases on record and the number now had increased to 150. Those cases in which the cyst was excised gave a mortality of 40 per cent., while those in which it was simply drained gave a mortality of 6 per cent.

STENOSIS OF THE PYLORUS AND DUODENUM WITH EXCISION AND POSTERIOR GASTRO-ENTEROSTOMY.

DR. JOHN F. ERDMANN presented a woman, 21 years old, who four years ago began to have pain in the abdomen, which had persisted up to the present time. Eight months ago she began to vomit frequently, and complained of constant pain in the upper right quadrant of the abdomen, which became worse shortly after eating. When severe, it radiated towards the epigastrium. Vomiting, which occurred about an hour after eating, usually relieved the pain. The vomitus was bitter and sour, and never contained blood. Belching and the regurgitation of a bitter fluid frequently occurred after eating. The patient's appetite was poor; her bowels were habitually constipated. She had occasional headaches; no dizzy spells; no eye symptoms; no œdema. An X-ray was taken, which showed a stenosis in the region of the pylorus.

Operation, November 12, 1909: Upon exploring the pyloric region, a stenosis was found, with considerable cicatricial tissue proximal to the pylorus. An inch and a half of the duodenum was contained in the cicatrix, bound in dense adhesions, so that the diameter of the entire mass in this section was not over three-eighths of an inch. Excision of this portion of the duodenum was done, the proximal end was inverted with purse-string sutures, and a like procedure was carried out at the pyloric end of the stomach. A posterior gastro-enterostomy was then done. The patient made a prompt recovery, and had since gained considerably in weight.

PYLORECTOMY AND PARTIAL GASTRECTOMY FOR
PERFORATING ULCER.

DR. ERDMANN presented a woman, 39 years old, whose history dated back six or seven years. She complained of vomiting and difficulty in taking food for several months before she was admitted into the Post-Graduate Hospital. Dr. Erdmann operated upon her in January, 1909, and found an old, perforated ulcer of the pylorus, with dense adhesions and much exudation. He excised the lower third of the stomach, turned in the proximal end of the duodenum and did a posterior gastro-enterostomy. The woman made perfect recovery, and had gained 70 pounds since the operation.

TUBERCULAR STENOSIS OF THE ILEUM, WITH EXCISION.

DR. ERDMANN presented a man, 38 years old, who one year ago had an attack of epigastric pain following a heavy meal. This was relieved by an emetic and he had no further trouble until four months ago, since which time he had severe pains whenever he was constipated for 48 hours or longer. These attacks of pain came on at irregular intervals—sometimes two or three days or one or two weeks would elapse between them. The pain had no relation to the kind of food taken, but he was always relieved by catharsis. During these attacks there was some abdominal distention. He never vomited, excepting following catharsis. There was no history of blood in the vomitus nor stools. His appetite was good, but he feared to eat on account of the subsequent pain. His weight had decreased 30 pounds in four months.

When this patient entered the Post-Graduate Hospital, Sept. 8, 1908, in Dr. Quintard's service, to whom Dr. Erdmann is indebted for the case, there was no tumor of the abdomen; no rigidity nor tenderness. The stomach contents were examined with negative results. He had a few external hemorrhoids which were removed by another surgeon, and the patient left the hospital on October 22, improved. He was re-admitted on November 11, 1908, complaining of constant cramps after eating, the pain beginning just above the navel about one or two hours after taking food. All foods excepting liquids produced these cramp-like pains. The pain gradually increased in severity until the patient sought relief by an emetic, or until relief came in the

course of about ten hours. Recently, the patient had observed gurgling and peristalsis during these attacks.

Upon palpation, a cylindrical-shaped mass was felt in the abdomen, in the left lumbar region. There was visible peristalsis, most noticeable in the region of the mass. As the patient felt somewhat improved, he asked for his discharge. Upon his return to the hospital, on February 3, 1909, he stated that for eighteen days after his second discharge he had been free from symptoms, but after indulging in his Christmas dinner, the pain had recurred.

Operation by Dr. Erdmann, February 9, 1909: Through an incision made below the umbilicus the small intestine was found not to be completely obstructed. The ileum was not sharply contracted, and about normal in size. Upon pulling up one coil of intestine after another, a coil of ileum was exposed with a spot about the size of a finger-nail which was the seat of two or three small growths, resembling tubercles. A clamp was applied to this area as a marker, and the intestine was further exposed, and finally, in the right quadrant, a mass four inches in length was found with a central contraction which appeared to be carcinomatous, although its outer surface strongly suggested tuberculosis. At the time of the operation it appeared to be tubercular, but the annular contraction suggested malignancy. The jejunal portion was about an inch and a half in diameter, while at the proximal end there was marked dilatation and hypertrophy.

It was decided that the most rapid method of performing an anastomosis would be to clamp the ends and invert by purse-string sutures. About sixteen inches of gut were resected, and a Roosevelt clamp was used to perform a lateral anastomosis. The patient made a perfect recovery and left the hospital on February 25, 1909.

The pathological report, made by Drs. Brooks and Coffin, stated that the specimen showed a complete tubercular stricture of the gut, with typical tubercle bacilli, giant cells and miliary nodules.

HEMORRHAGE FOLLOWING TONSILLECTOMY.

DR. ADRIAN V. S. LAMBERT presented a girl, six years old, who was admitted to the Roosevelt Hospital in Dr. L. W. Hotchkiss's service on November 20, 1909, with the following history:

On the afternoon previous to her admission her tonsils were removed by enucleation by the finger, and her adenoids were removed by the curette. She had bled profusely at the time; the bleeding soon diminished in amount, but still continued to a slight extent. During the night she had several times vomited large dark blood-clots, and had expectorated bright blood from time to time. She had been very restless, and small doses of morphine had been given to quiet her. Various gargles had been employed, but with no effect on the bleeding.

On admission to the hospital, the child was very pale and restless, with a pulse of 160; respirations, 32. She was spitting up bright red blood at the time, and soon after admission she vomited four ounces of dark clotted blood and went into collapse. Her pulse became imperceptible at the wrist; respirations were rapid and shallow, but regular. She was at once given 250 c.c. of saline infusion intravenously, and two hours after admission she was taken to the operating room and a transfusion was done, the mother being the donor. The connection was readily made by means of the Elsberg cannula. The flow was free and rapid, and was allowed to continue for about forty minutes. The child before the transfusion was unconscious and almost exsanguinated; so much so, that she did not move when the incisions were made to expose the veins, and there was scarcely any bleeding from the wounds. When she was returned to the ward she was in excellent condition, with a pulse of 124 and respirations 24. She was perfectly conscious and all hemorrhage had ceased. She was given three minims of Magendie's solution and slept for four hours; then she awoke and cleared her throat by a slight cough, which was followed by a profuse hemorrhage of eight ounces of bright blood lasting twenty minutes. The flow then became less rapid, but there continued a slight, continuous flow evidenced by constant spitting up of small quantities of bright blood. Her pulse again became rapid and small; she was very restless and complained of thirst.

She was again taken to the operating room, and after etherization by the drop method, open cone, an examination of the pharynx and fauces was made, which revealed a constant flow of bright blood from the left tonsillar bed. No bleeding point could be made out. The left external carotid artery was thereupon ligated in its first portion near the bifurcation. This in-

stantly and completely controlled all bleeding. The child made an uneventful recovery, with the exception of an infection of the wound in the arm by *staphylococcus pyogenes aureus*. This is now granulating and has about healed.

DR. ELIOT said that in 1888, at the New York Hospital, Dr. Edward White Clark checked a persistent hemorrhage from the tonsil by inserting a suture encircling the tonsil.

DR. FRANK S. MATHEWS said that at the St. Mary's Hospital for Children they had had one fatal case among 600 children who were operated on for tonsils and adenoids during the past year. Enucleation of the tonsil gave rise to more hemorrhage than tonsillotomy. The main indication, in these cases, was to check the primary hemorrhage. The case reported by Dr. Lambert appeared to be one of persistent primary hemorrhage. Personally, he made it a point to see that the bleeding was checked before the child left the table. The oozing could usually be readily checked by taking the end of a moistened bandage and plugging it into the tonsillar cavity, the plug being sufficiently large to cover the pillar, and then pressing it against the jaw with two fingers. The pressure, in order to be effective, should be made against the lower pole of the tonsillar fossa, as the bleeding usually came from there from one of the branches of the facial artery. The upper portion of the tonsillar cavity never seemed to bleed.

TUBERCULOSIS OF THE TONSIL.

DR. FRANK S. MATHEWS presented a boy, eight years old, who came to St. Mary's Hospital for Children suffering from tuberculous glands of the neck. An abscess and the glands were excised, and two weeks later the stumps of the tonsils were removed. The history obtained was that the boy had had his tonsils "clipped" some months before. Soon afterwards, the glands in the left side of the neck became enlarged, and later on an abscess formed. The stumps of the tonsils, on examination, showed typical discrete miliary tubercles.

Clinically recognizable tuberculosis of the tonsil, Dr. Mathews said, was rarely seen. Moreover, routine examinations of the tonsils, as in the cases of Hodenpyl, who sectioned several hundred, failed to show evidences of tuberculosis. The speaker said he had not examined tonsils as a routine procedure, but had examined a number which grossly showed spots suggestive of

tubercle without finding it in any instance. In a number of tonsils from patients with large tuberculous glands of the neck he had been equally unsuccessful in finding tuberculous ones. He had made a practice of inspecting the throats of all patients with tuberculous glands, and as a result felt that there was no relation between tuberculous glands of the neck and any particular kind of tonsil. One might see large or small or buried or elevated tonsils in a series of children with glandular tuberculosis. Such facts might make one question whether the tonsil was the usual site of entry of the bacillus. Personally, he believed that nine-tenths of the cases were infections through the faucial or pharyngeal tonsil. This was strongly suggested by the fact that the tonsillar nodes were usually the first to be enlarged in tuberculosis. Hurd had recently reported eight cases of tuberculous tonsils, and concluded that tuberculosis was to be found in the buried rather than in the large hyperplastic tonsils; that the tubercles were to be found deep-seated at the bottom of the crypts of the tonsil just inside of its capsule, and that in cases of neck adenitis of long standing, tuberculous foci, if there were any, would not continue to be demonstrable in the tonsil. We must look for tubercle of the tonsil in early cases. Tuberculous adenitis had been produced by rubbing tubercle bacilli upon the tonsil of animals without producing tuberculosis of the tonsil itself, a condition analogous to the frequently observed tuberculous mediastinal nodes without demonstrable lung lesions.

Evidence, so far as it went at present, would indicate that the tonsil was the usual portal of tuberculous infection in cases of cervical adenitis, even though tuberculosis of the tonsil was so infrequently demonstrated. A lesion might be produced in the tonsil, but it tended to heal rather than go on to tuberculous ulceration. The reasons why tuberculous tonsils were so infrequently seen were, first, the surgeons did not as a rule remove the tonsils when operating on tuberculous adenitis; second, when they were removed, tonsillotomy and not tonsillectomy was done, and, as Hurd showed, the tubercle was in the deep portion of the tonsil that was left behind. The case presented to-night, Dr. Mathews said, bore out that statement. It seemed perfectly possible that the tubercle bacillus frequently passed through the tonsil without lesions or only such as would be discovered by making serial sections.

FIG. 1.



Ununited fracture of shaft of femur.

Eisendrath, a number of years ago, urged the wisdom of attending to the tonsils in all cases of cervical adenitis. Dowd's statistics, showing over 90 per cent. of cures in *early* glandular infections, and 75 per cent. to 80 per cent. of cures in a total of 250 cases in all stages of the disease, would show at least that it was not usually necessary. Whether these statistics would have been made better or worse by adding another operation to that of adenectomy remained to be seen. If the tonsil did not harbor the tubercle bacillus at the time of the neck operation, it would certainly be wiser not to have the patient incur the additional operation. If it did, of course there was the possibility of reinfection of the neck.

This case, as well as two others seen recently by the speaker in private practice, indicated that tonsillotomy was no safeguard against tuberculous invasion of the neck nodes, while presumably tonsillectomy was.

OLD UNUNITED FRACTURE OF FEMUR: PSEUDARTHROSIS.

DR. MATHEWS presented a woman, fifty years old, who 23 years ago sustained a simple fracture of the middle third of the right femur. This was treated by the usual methods, but failed to unite. She was then sent to a large hospital, where she received the best surgical attention. The fragments were first rubbed together and subsequently an open operation was done, but no union resulted. An iron brace was then applied, and the patient was able to get about with the aid of a crutch. After five or six years she found she could get along without the crutch, and in the course of time she also abandoned the brace. Since then she had walked without artificial aid.

There was four inches shortening in the right leg, and the X-ray (see Fig. 1) showed that the ends of the two fragments were ununited and the bones everywhere at least an inch apart. They were freely movable, and there was apparently only fibrous union between them, but in spite of that the woman stated that she was able to walk five miles with comparative comfort.

CHOLECYSTOSTOMY FOR GALL-STONES.

DR. ALEXANDER B. JOHNSON presented a woman, 38 years old, who was admitted to the New York Hospital on September 13, 1909. For one week prior to admission the patient had severe,

cramp-like pain in the right hypochondrium. This was present almost constantly, with slight remissions, and was relieved only by morphine. The pain radiated toward the shoulder, and during these attacks there was profuse perspiration. She had suffered from nausea, but no vomiting. No jaundice had been noted; there were no urinary symptoms. She was constipated, but her stools had always been normal in color, so far as she knew.

Examination revealed tenderness over the right hypochondrium, particularly in the region of the gall-bladder. The liver was normal in size. The patient was obese and the abdominal wall unusually thick.

On September 14, Dr. Johnson made a vertical incision, seven inches long, at the outer border of the right rectus. The gall-bladder, which presented in the wound, was markedly enlarged. Mucus and bile were aspirated with the suction trocar, and several stones were removed, ranging in size from that of small shot to that of a beechnut. No stones were found in the common duct. A drainage tube was inserted and the wound closed. Drainage was continued until the twentieth day. With the exception of a slight post-operative temperature, the patient's recovery was uneventful, and she left the hospital on October 9, 1909.

A second case of cholecystostomy was shown by Dr. Johnson: A single woman, 54 years old, who was admitted to the New York Hospital on October 14, 1909. For the past year she had had indefinite, dull pains in the right hypochondrium. A week ago she was seized with a very acute pain which radiated up into the right shoulder-blade and toward the epigastrium. There was no history of jaundice. She had vomited once or twice during her last attack, and had complained of chills. Her stools had always had a good color.

Examination revealed tenderness to deep pressure in the right hypochondrium. The abdomen was otherwise negative. The heart showed the changes of a chronic myocarditis, without valvular involvement.

On October 23 Dr. Johnson exposed the gall-bladder by a vertical incision about five inches long through the right rectus. The gall-bladder was distended, and its contents, which were chiefly mucus, aspirated. Upon exploration, one small, round, non-faceted stone, about the size of a large pea, was found and removed from the cystic duct. A drainage tube was then inserted, with a strip of gauze packing beside it.

The patient made an uneventful recovery, with a very slight rise in temperature the day following operation. The wound healed *per primam*, with the exception of the sinus left for drainage. The tube was removed in a week's time. After that there was a very moderate flow of bile and mucus for about ten days, when this ceased, and the sinus closed by granulation. At no time was there any evidence of suppuration. The patient's heart never gave any symptoms after the operation.

GUNSHOT WOUND OF THE BRAIN.

DR. JOHNSON presented a man, 34 years old, who, on November 3, 1909, received a pistol-shot between the eyes, the revolver being held close enough to fill his face full of powder grains and inflict a slight burn. He was brought to the hospital and taken to the operating room a few hours later, never having lost consciousness nor in any way shown any specific effect of his brain injury. There were no focal symptoms; merely bleeding from the wound together with the escape of brain tissue, with pronounced œdema of the tissues around the point of entrance of the bullet. No headache.

Operation: Upon enlarging the wound in the forehead and opening the frontal sinus, it was found that the bullet had penetrated the orbital plate of the frontal bone. Brain tissue was issuing through the perforation in the bone. Drainage of the cranial cavity with a small gauze wick.

An X-ray picture showed that the bullet now lay in the body of the sphenoid bone. Microscopical examination of the particles of suspected brain tissue removed at the time of operation showed brain tissue, with numerous scattered hemorrhagic foci.

After the operation, the patient made an uneventful recovery, the wound healing by granulation.

DR. WILLY MEYER said that at a meeting of the Society about three years ago he showed a young man from whose cranial cavity a bullet had been removed by him on the urgent request of the patient. The case was one of attempted suicide, the patient shooting himself in such a way that the bullet divided both olfactory and both optic nerves, resulting in total blindness and a loss of the sense of smell. In addition to this, there were severe and persistent headaches. An X-ray was taken, which showed the bullet lying close to the sella turcica, together with splinters of

lead. Craniotomy was done by means of a horse-shoe flap, the bullet was located and removed, but, as anticipated, the operation did not relieve the patient's headaches. He subsequently succeeded in taking his life.

CROSSED RENAL DYSTOPIA WITH FUSION.

DR. ALEXANDER B. JOHNSON presented a man aged 20 years, clerk, who was admitted to the New York Hospital February 2, 1908.

Up to this present illness he had never observed any symptoms referable to his genito-urinary apparatus. One year ago he began to suffer from attacks of cramp-like pain referred to the region of the left kidney. The pain was severe and was accompanied by nausea, vomiting, chilly sensations and constipation. The duration of the attacks was from twenty-four to forty-eight hours; he had observed that during the continuance of the pain the quantity of urine voided was notably diminished; the attacks ended suddenly and the disappearance of the pain was accompanied by the passage of a large quantity of urine.

Soon after the attacks had commenced he had observed that during the continuance of the pain a palpable tumor mass formed in the left hypochondrium. At first the attacks occurred about once a month, but they gradually increased in frequency until at the time of his admission to the hospital they occurred about once in ten days. The tumor increased in size with each recurring attack. On February 5, 1908, he came under the care of Dr. F. W. Murray in the New York Hospital, who made a diagnosis of intermittent hydronephrosis, and operated upon the patient the same day. Upon exposing and palpating the kidney, a diagnosis of fused kidney was made. The hydronephrotic sac was opened and drained. It contained more than a quart of bloody urine. The sac was drained for a month through a tube. The tube was then removed and the sinus was allowed to heal. Following the operation the patient's ureters were catheterized with styletted catheters by Dr. Alfred Taylor. Upon the left side the catheter was readily introduced its entire length; upon the right side the catheter passed easily for a few inches, when obstruction was met; upon further pressure, however, the catheter passed onward readily. An X-ray picture of the patient taken with the catheters in situ showed that the catheter in the right

ureter crossed the median line of the body to the left side in the mid-lumbar region so that the upper ends of both catheters lay to the left of the median line. The patient left the hospital.

He was again admitted to the hospital on October 20, 1909, and came under Dr. Johnson's care. In the interval he had suffered from a number of attacks of pain, etc., as before; the present attack, however, was very severe; the pain was of an agonizing character and was referred to the left hypochondrium and left lumbar region. Upon physical examination a distinct bulging could be seen in the upper left quadrant of the abdomen and upon palpation a firm tender reniform tumor could be felt occupying the entire left upper quadrant and the left loin. It was flat on percussion except where the colon crossed it in front. The patient was passing a very small amount of urine. At the end of twenty-four hours the pain subsided, the patient passed a large quantity of urine containing some blood and the tumor diminished in size and became less tense. Dr. Johnson operated upon the patient on October 23, 1909. The kidney was exposed by a long incision parallel to the ribs; it was separated from the peritoneum by dissection with the fingers, so that its outer and anterior surfaces could be palpated. The organ was enormously increased in size and formed a dense, firm mass. Upon its lower pole to the left of the median line, though partly in front of the bodies of the lumbar vertebræ, could be felt a firm, rounded, elastic mass about two inches in diameter. This mass plainly represented the right kidney. It was firmly fused with the lower pole of the dilated organ of the left side and was too small to carry on the entire renal function of the individual. In order to make sure of the true condition, the peritoneal cavity was opened and a hand introduced to the opposite side of the belly; no kidney could be felt upon the right side. The wound was closed by suture and promptly healed. The patient left the hospital but soon returned very ill indeed. For forty-eight hours he had had anuria and was suffering great pain. Uræmic symptoms were absent. The abdominal tumor was greatly distended and tense. It was thought best to afford relief by draining the kidney. A small incision was made in the loin and the kidney was incised; the wall of the sac was half an inch thick and very tough, and about two quarts of bloody urine was evacuated. The dilated pelvis and calyces were explored with the finger in the hope of finding

and extracting a stone; no stone was found; further exploration was prevented by very severe bleeding from the interior of the sac, which necessitated the packing of the entire cavity with gauze. The hemorrhage was so severe that strenuous measures were necessary, saline infusion, etc., to save the patient's life. The packing was removed after some days and a large rubber catheter inserted in its place. After the patient was able to be up and about the outer end of the catheter was closed with a clamp. The patient was able to keep himself dry and by removing the clamp to evacuate the kidney at suitable intervals. During the fortnight following the operation no urine was passed by the urethra; thereafter small quantities of urine were passed from time to time but most of the urine now escaped through the loin.

As yet the interior of his kidney had not become seriously infected and the patient was fairly comfortable. Dr. Johnson said he feared, however, that the outlook for this young man was unfavorable. He thought serious infection would sooner or later occur and destroy the patient's life.

DIVERTICULITIS OF SIGMOID.

DR. JOHN A. HARTWELL presented two patients: The first patient was a man, 42 years old, who was admitted to the Presbyterian Hospital in the service of Dr. Eliot on April 21, 1909, suffering from an acute abdominal lesion.

Two days prior to admission this man had developed the typical symptoms of an acute intestinal obstruction, and these had increased continuously. He had vomited several times, and neither gas nor fæces had been passed. For three or four days prior to the onset of the acute symptoms, he had noticed that his bowels were constipated, which was for him a very unusual thing.

Physical examination on admission showed that the abdomen was uniformly distended and tympanitic, excepting in the left flank, where there was a small area of dullness. About an inch inside of the anterior superior spine of the ilium and above it was felt an elongated mass, about the size of an apple, along the course of the sigmoid. This mass was tender, and above it the distended colon could be mapped out by percussion. Careful questioning failed to get any evidence that the patient had ever

been conscious of any abdominal lesion prior to the onset of his acute symptoms. With these, however, the pain was most severe at first at the site of the tumor.

Under gas and ether anæsthesia, a laparotomy was immediately done, the peritoneum being opened over the mass. A walled-off abscess was found lying outside the sigmoid, just above the pelvic brim, which communicated with the lumen of the bowel through a gangrenous-looking perforation. For a distance of about two inches the entire bowel wall was markedly thickened, as was the mesentery connected with it. There were two adhesion bands kinking and pressing on the gut in such a way as to cause obstruction, but it was noted that the colon, as far as it could be seen above this point, was not unduly distended. A primary resection of the diseased portion was done by the usual method with an end-to-end anastomosis. The abdominal wound was sutured, with drainage.

The post-operative course was unsatisfactory, and the symptoms of obstruction increased rather than lessened. After twenty-four hours, therefore, the wound was opened, and as the anastomosis did not look entirely satisfactory, though the lumen was patent, the stitches were removed and a Murphy button inserted. It was again noted that the colon above this point was not distended, and it was believed that the paralysis of the bowel was so great that the obstruction would not be relieved. Accordingly, a right iliac enterostomy was performed on the first loop which presented itself. This proved to be the jejunum, high up, so that later it had to be closed by suture.

Following the enterostomy, the patient progressed toward recovery, although he was hardly out of danger for a week owing to his toxic condition resulting from the intestinal obstruction. A small fæcal fistula developed at the site of the sigmoid anastomosis, but this closed spontaneously. It was necessary, however, to open the abdominal wound again to dislodge the Murphy button, which had become fixed in the lumen of the gut at the brim of the pelvis. The gut was not opened for this purpose, the button being pushed down through the intestinal wall so that it could be grasped by a finger in the rectum and extracted.

The pathological report, made by Dr. Meakins, on the section of the intestine that was removed, was as follows:

The specimen consisted of a portion of the colon. At one point there was a slight depression from which an ulcerating channel led to the peritoneal surface. Microscopically, the section showed a muscularis and abundant subperitoneal fat, all of which was the site of chronic inflammation. A section taken across the mucous membrane through the entire tract of the perforation showed the mucous membrane and the other coats dipping down through the wall of the gut. First, the mucous membrane became ulcerated and disappeared; the muscularis continued farther, covered with necrotic material until it became thinned out and finally disappeared. Beyond this the subperitoneal fat alone remained, covered with necrotic material. For a considerable space around the sinus, all the tissues showed marked chronic and moderate acute inflammation.

Diagnosis: Diverticulitis, with chronic inflammation. Several other diverticula large enough to admit the point of a probe were found in the excised section of the colon.

This case, Dr. Hartwell said, illustrated a distinct type of the condition resulting from diverticulitis of the sigmoid. There were no symptoms whatever until the diverticulum, by its perforation, had set up a local peritonitis with abscess, and the resulting adhesions produced intestinal obstruction. The patient's convalescence, after the first operation, was complicated by the error in doing a primary resection and anastomosis. This, in the presence of an acute obstruction of the colon, should not have been done, because, as in this case, failure to relieve the obstruction frequently resulted. Since the lumen of the gut was not markedly narrowed, and since the condition was simply inflammatory, packing of the abscess cavity would probably have accomplished a cure. The fear, however, that the condition was either cancerous or tuberculous led to its removal, but even with this in mind a two-stage operation would have been better.

The second case shown by Dr. Hartwell was a man, 23 years old, who was admitted to the Presbyterian Hospital on August 9, 1909.

When he was ten years old, he had some form of gastro-intestinal trouble, with blood in the stools. There was no history of pain nor vomiting. He was in bed only two weeks, but was unable to attend school for six months. From that time on he enjoyed good health until May, 1906, when he developed some infection of the lymph-glands on the right side of the neck. These became swollen and painful, but did not confine him to bed. During the night of May 20, without premonitory symptoms of a gastro-intestinal character, he was awakened with

nausea but no pain, and vomited more than a pint of pure blood in the form of dark red clots. During the following two days he continued to vomit blood at intervals, and on May 22, 1906, he was admitted to the Presbyterian Hospital, in Dr. David Bovaird's service. Examination at that time showed enlargement of the lymph-glands throughout the body. The right cervical glands were acutely inflamed and breaking down. The spleen was enlarged; otherwise the abdominal organs were normal. A blood examination showed 2,300,000 red blood cells; 23,500 white cells; 82 per cent. of polymorphonuclears, and 30 per cent. of hæmoglobin.

On May 30 the glands were incised and pus evacuated. Cultures showed sarcinæ and a large bacillus; no pus organisms and no tubercle bacilli were found. On June 18 there were evidences of fluid in small amounts in both pleural cavities. These disappeared spontaneously, and when the patient left the hospital on July 9, 1906, the sinus in the neck had not quite closed; the red blood-cells numbered 3,816,000, and the hæmoglobin had increased to 64 per cent. The diagnosis at this time was gastric ulcer and cervical adenitis, possibly tubercular, though this was not proven.

From this time until May 30, 1909, the patient enjoyed excellent health in every way. He worked regularly, and showed no symptoms of any acute or chronic disease. On that night—after rather violent exercise during the day—he was suddenly awakened with vomiting of dark red blood. This was repeated several times, and he felt sick and nauseated. The vomiting did not recur after that. He was admitted to the Bronxville Hospital, where a routine examination by Dr. Charlton disclosed a mass in the left lower quadrant of the abdomen. On close questioning, the patient thought he had noticed this lump for some time.

When the patient came to the Presbyterian Hospital the abdomen was not distended, but slightly more prominent in its left lower quadrant, where there seemed to be a slight bulging on inspiration. There was no rigidity. In the left lower quadrant there was an oval mass 11 cm. in length and 6 cm. in width, situated just above Poupart's ligament and extending upwards and outwards from near the symphysis pubis towards the anterior superior spine. This was dull on percussion; its surface was hard and smooth, non-fluctuating; it was adherent, and appeared to extend down into the pelvis. It did not change in position

with the position of the patient, nor could it be moved from side to side. It was moderately tender. Upon rectal examination the mass was found to extend into the left side of the pelvis, and its lower section could be palpated as a hard, slightly irregular, tender mass. The percussion note over the entire abdomen was not as tympanitic as normal, especially in the regions over Poupart's ligament. There was slight dulness in the right flank, and the left flank gave dull tympany which changed to pure tympany when the patient turned on his right side. In the knee-chest position there was dull tympany in the epigastric region. These signs suggested the presence of a small quantity of free fluid. Peristalsis seemed normal. The rectal mucous membrane above the valves seemed congested, and there were a few pin-point areas, evidently inflamed follicles. The spleen extended for a distance of 4 cm. below the costal cartilage of the ninth rib in repose. It was firm, and descended with the movements of inspiration. A blood examination, made on August 20, showed 4,480,000 red blood-cells, 5,700 white cells, and 77 per cent. of hæmoglobin. No acetone nor acid bodies were found in the urine. Tests of the fæces for blood were positive, but the patient was eating meat at the time. No ova nor parasites.

During the patient's stay in the hospital his stools were repeatedly examined for tubercle bacilli, but none were found. No parasites, pus nor red blood-cells were ever present, though he gave a positive chemical blood test. The von Pirquette test was negative for tuberculosis, as was also the Wassermann for syphilis. The Cammidge reaction for pancreatic disease was also negative. During this period the blood gradually regained nearly a normal condition, the count showing 4,480,000 red cells, 5,700 white cells and 77 per cent. of hæmoglobin. His pulse rate was about 70, and his temperature was practically normal. The local condition in the abdomen had not materially changed.

On August 21, 1909, under gas and ether anæsthesia, an incision was made in the left lower abdomen over the mass, and carried into the peritoneal cavity where the tumor was located. The abdomen contained a small amount of serous exudate. The large intestine, from the splenic flexure to the rectum proper, was found to be the seat of a marked uniform thickening involving its whole circumference. The wall was estimated to be about three-eighths of an inch thick, so that the intestinal tube was

rigid and hard, but its lumen was not appreciably narrowed. At the splenic flexure the lesion had to a certain extent kinked the bowel, causing a moderate degree of obstruction. The mesentery of the descending colon was thickened quite as much as the bowel itself. The spleen was soft, and somewhat enlarged. No other lesions were found in the peritoneal cavity after a thorough examination, and there were no evidences of tuberculosis. The adhesions which were causing the obstruction were loosened, and the whole length of the descending colon was examined for the purpose of finding a perforation or some other cause for the condition at hand. The process gave all the appearances of a simple inflammatory thickening involving the bowel and its mesentery. As it was impossible to eradicate the disease, the abdomen was closed, with drainage.

A pathological examination of the peritoneal fluid showed it to be sterile. Microscopical examination of a small piece of tissue removed from the surface of the bowel showed it to be fat, infiltrated with small round cells and extravasated blood. There was an increase of fibrous tissue, and the walls of the blood-vessels were thickened and their lumen contracted. There was no noteworthy perivascular change, and no evidence of either syphilis or tuberculosis could be found. The diagnosis made by the pathologist was chronic fibrous peritonitis.

The post-operative history of the case was uneventful. There was but little drainage from the wound, and it healed kindly. Since the patient's discharge from the hospital, on September 10, he had been attending to his work and was in excellent health. There was still present a mass in the left lower abdomen which had not materially changed since the operation, but had given rise to no symptoms whatever.

The diagnosis in this case, Dr. Hartwell said, must still remain in doubt. All the evidence pointed to the condition of the colon as being one of a simple inflammatory process involving the coats outside of the mucous membrane. Tuberculosis and syphilis both involved the mucous membrane, and gave symptoms of such involvement. Cancer could be ruled out by the extent of the disease, and the subsequent good health of the patient. These exclusions, together with the microscopical findings, justified the diagnosis of simple pericolicitis and perisigmoiditis and mesen-

teritis. All these conditions arose from diverticulitis, as had been amply demonstrated both by previous writers and by the specimens here presented, and the speaker said he therefore felt it proper to include this case as one of probable multiple diverticulitis.

SUBPHRENIC ABSCESS FOLLOWING ACUTE APPENDICITIS.

DR. WILLY MEYER presented a girl, 12 years old, who came under Dr. Meyer's care on September 24, 1908, on the fourth day of an attack of acute appendicitis, the original symptoms of which had been rather uncertain. When the speaker first saw her the symptoms were such as to demand an immediate operation. Upon opening the abdomen, the omentum was found covering a gangrenous appendix like a cap. The appendix was removed and a cigarette drain inserted into the pelvis, which had been filled with pus. The patient made a good recovery, but on October 5 the temperature, which had been slowly rising, indicated the presence of pus, and two days later she had a severe attack of coughing and expectorated pus. The temperature now was 106, with an extremely weak and rapid pulse. Examination showed dulness over the right lung posteriorly, with absence of pectoral fremitus and an area of tympanitic sound anteriorly at the level of the eighth intercostal space. Here an incision was made and through this a large amount of stinking pus and air escaped. The air rushed in and out as in operations for empyema. It was believed that a pleuritic septic effusion due to an embolic lung affection had been evacuated. A rib was then rapidly resected, and the wound drained.

This operation failed to improve the patient's septic condition. The fever was still elevated, and she continued to expectorate pus. She was taken to the roof garden, and kept in the open air day and night. About this time she developed an abscess below the liver which was opened and drained, and from which for a long time there was a discharge of foul pus. Later the first chest incision had to be enlarged and a larger piece of the eighth rib resected to insure continued good drainage. It then became evident that Dr. Meyer had opened into an acute subphrenic abscess which had perforated through the diaphragm into the bronchial tree. The patient was subsequently sent to the mountains and finally made a complete recovery.

RESECTION OF THE SIGMOID FOR MULTIPLE DIVERTICULA.

DR. A. V. MOSCHCOWITZ presented a woman, 40 years old, who was operated on eleven years ago by another surgeon for what were supposed to be tubercular glands of the neck. In June, 1902, she was operated on by Dr. Moschcowitz for an extensive packet of varicose veins upon the right lower extremity. In October, 1904, she was operated on for acute gangrenous appendicitis, and about three months later for a right femoral hernia. In the interims of these operations she had been in the hands of competent internists for stomach trouble, and she also complained of pain in the left iliac fossa, with tenesmus and the passage of mucus and blood. Upon palpation of the abdomen, a sausage-shaped mass could be outlined in this region: it was hard, and in view of the patient's emaciated condition, it raised a strong suspicion of carcinoma.

The abdomen was opened by Dr. Moschcowitz in June, 1906, and at that time he made a diagnosis of multiple diverticulitis. The sigmoid flexure was very firm and contracted, and there were numerous scars in the mesosigmoid, showing distinct evidences of past inflammation. The shape of the bowel was like a double-barrelled gun, the coils being parallel to each other.

Subsequent to this operation, the patient still continued to pass mucus and blood. She was operated upon again in March, 1909, at which time a resection of the gut was done, with an end-to-end anastomosis by suture. From this operation the patient, after a rather stormy convalescence, finally made a complete recovery, and she had since enjoyed good health.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, held January 3, 1910.

The President, DR. WILLIAM J. TAYLOR, in the Chair.

COMBINED CYSTOSCOPIC AND ROENTGENOGRAPHIC EXAMINATION OF THE URETERS AND KIDNEYS.

DR. ALEXANDER UHLE read a paper with the above title, which presented the results of work done by Drs. PFAHLER, MILLER and MACKINNEY in conjunction with himself. See page 546.

DR. PFAHLER remarked that although it is generally supposed that the diagnosis of ureteral or urinary calculi is comparatively simple; this is not the case. There are a great many confusing shadows. In at least half the cases the plates must be repeated to be sure of what has been found. Ordinarily, when they are repeated, one can be sure; occasionally, however, shadows still occur that are almost impossible to diagnose positively, although here, as in every line of work, experience comes into play.

DR. FRANCIS T. STEWART said that he had recently been pursuing a similar line of inquiry, using leaded catheters and collargol 2 per cent. In his series of cases the capacity of the pelvis of the kidney ranged from 3 to 18 c.c. It seems that if one gets an adventitious X-ray shadow, one can be almost sure with these methods of examination whether it is or is not a urinary calculus, but frequently the shadows of calculi do not show on plates. In four instances at least he had been able to recover a stone from the ureter, usually by oil injections, in cases in which the stone did not show on the plates. Phleboliths may often be felt through the vagina or rectum. A few years ago he showed before the Academy some X-ray plates of phantom ureteral calculi. As to the dangers of ureteral catheterization he feels

that he should not keep silent, in view particularly of a case which he recently examined for Dr. Mitchell. After catheterization this patient had absolute anuria for a day and a half; at the end of that time urine was again secreted and the patient recovered, but for a time it looked as if the result might be fatal.

DR. JOHN B. DEEVER said that there was no doubt that in a certain class of cases calculi cannot be diagnosed by the X-ray alone, and all must see the importance of the introduction of the catheter and the X-ray taken under these circumstances. The question of the risk attached to distending the pelvis of the kidney will become less as one becomes more expert in manipulation of the catheter. He called attention to one case which Dr. Pfahler had shown in which a stone was removed from the ureter extraperitoneally at a time when a hysterectomy was done for fibroid uterus; the patient made a good recovery. That case would probably not have come to operation for ureteral calculus had not the diagnosis been made by the X-ray and verified by catheterization.

DR. ORVILLE HORWITZ said that he had had one experience in which the injection of silver solution employed by Dr. Uhle caused anuria, which persisted for about twenty-four hours, causing great anxiety. He had never seen suppression of urine following a simple catheterization, although he was aware that this complication had been encountered by other observers. All had had the experience of passing a catheter past a partial obstruction caused by impacted stone. When this condition persists a diagnosis of stricture is usually made until Röntgenographic examination reveals the presence of calculus. It may not be uninteresting to call attention to the fact that ureteral catheterization or Röntgenographic examination may give wrong information, thus leading to a mistake in diagnosis. In a certain proportion of cases, no matter how skilfully or gently the catheter may be manipulated, the examination causes a hemorrhage which makes it very difficult to determine whether the blood in the urine is due to traumatism or to a pathological cause.

Dr. Uhle has pointed out that when an X-ray picture reveals a shadow alongside, or in the course, of the ureter it is frequently difficult to decide whether it is a phlebolith or calculus. He had an experience of this kind once with a patient who had a calculus causing an obstruction of the ureter located at the brim of the pelvis. It was with difficulty that the catheter could be made to

pass the co-arction; the Röntgenographic examination was negative. Believing that the obstruction was caused by stricture, an exploratory examination was performed which resulted in quite a large urate stone being removed from the ureter. It is now well known that this rare form of calculus does not throw a shadow and consequently an X-ray picture in such cases is negative.

DR. ALEXANDER UHLE (in closing) said that, in regard to the dangers in the passage of the catheter, he had seen anuria on numerous occasions follow the passage of the catheter alone. In none of the cases he had observed was there any vomiting or any apprehension about the patient's condition. After allowing catheters to lie *in situ*, the kidneys, at times, fail to act for two or three hours, and the passage of a catheter through the ureter will occasionally cause hemorrhage even under normal conditions. A catheter left for any length of time in the ureter will cause some bleeding, not observable in the urine, but cystoscopic examination made two or three days later will show a small blood clot coming from the ureteral opening. This is ordinarily mistaken for tumor, and on two or three occasions the patients have been catheterized later and tumor suspected. Even normal patients used for experimental purposes will show slight hemorrhage.

In regard to diseased kidneys with symptoms all referred to the bladder, he had observed such cases. In tuberculosis the patient may complain of only frequent urination, all symptoms pointing to the bladder, but cystoscopic examination will show the bladder apparently normal.

DR. PFAHLER added, in answer to the question of traumatism, that by the gravity method of injection one can fill the ureter and pelvis of the kidney by passing the catheter only a few inches into the ureter, which is a distinct advantage. He thought this method to be limited in its field of usefulness. The great majority of calculi can be diagnosed without this, and if so there is no necessity for taking any additional risk; it is only occasionally that one wishes to be more certain regarding calculi at the lower end of the ureter. One which came nearest to misleading him was a mole on the patient's back. This patient had persistent hæmaturia; he could find no stone in the kidney, but after repeated X-ray examinations he found a beautiful shadow of what seemed to be a stone about half an inch above the upper pole and lying to the outer side. When the patient was on the

operating table, however, he saw there was a mole on the back in just this location, and so told the operator, who however decided to go on with the operation, but no stone was found, and no cause for the hæmaturia yet the patient recovered.

OPERATION FOR THE RELIEF OF AN INCURVATURE OF THE PENIS.

DR. ORVILLE HORWITZ read a paper with the above title, for which see page 557.

DR. JOHN B. DEEVER agreed with Dr. Horwitz that the Otis dilating urethrotome is a dangerous instrument if not used judiciously. He recalled one case of a doctor with a slight incurvation following an internal urethrotomy which he performed, and after this he was very cautious in the use of this instrument. He had seen slight incurvation a number of times occurring in the practice of others, but never any reaching the degree of Dr. Horwitz's case. The incurvation, though very slight, in a nervous man is enough to make him very uncomfortable.

The modification which Dr. Horwitz suggests is most important—that is, not to overdilate when the blade is drawn through the stricture. This is particularly important advice for young surgeons who are about to take up the Otis instrument.

MERCURY SALICYLATE INJECTIONS IN SYPHILIS.

DR. MACY BROOKS read a paper with the above title, for which see page 552.

DR. HILARY CHRISTIAN said that he had been all his life a most uncompromising opponent to the hypodermic treatment of syphilis, for the reason that he had always felt that the introduction of the drug in this manner rose to the dignity of an operation, involving the risk of abscess, considerable pain, and the danger of acute salivation, but he had had lately an open mind on the subject owing to the experience he had had in his service at the Philadelphia Hospital, and he had come to believe almost that the hypodermic treatment of an insoluble salt of mercury is superior to any form of internal treatment, although he had never had any fault to find with internal treatment except when the patient got beyond control and run away. He had seen in the wards of the Philadelphia Hospital such great results that he was compelled to come to the conclusion that there is probably a great future for the treatment of syphilis by the hypodermic introduction of an insoluble salt. This salicylate of mercury used by Dr. Gottheil

for ten years persistently with few if any abscesses and with absolute disappearance of all lesions, is entitled to some belief and respect.

DR. JOHN B. ROBERTS said that he had had a little experience recently with the hypodermatic use of mercury in a case of tertiary syphilis. The patient has specific osteoperiostitis of the tibia, and was treated by him with inunctions of mercury, and mercuric chloride with potassium iodide internally in enormous doses by the mouth for seven years. Several operations for splitting the periosteum and boring into the bone were done. The pain was alleviated but not entirely relieved. Recently he had been giving her succinimid of mercury, one-fifth grain, hypodermatically once a week, and it is astonishing how quickly she had been relieved of her pain, and how little discomfort she has as compared with that resulting from the other treatments given by mouth.

DR. THOMAS R. NEILSON said that he had been very much impressed by the results in one or two precocious cases of syphilis in which mercury given by the mouth was not efficacious, but he would not like to subscribe to the routine treatment of syphilis by the hypodermic injection of mercury, the risk hardly seeming worth while. However, it is valuable to have such treatment when the introduction of the drug by way of the stomach does not prove of value.

DR. ORVILLE HORWITZ said that at the present time most of the syphilographers are in accord in teaching that syphilis is best treated by administering a course of mercury for at least two and one-half years. Mercury should be given for a short period by mouth. This method should be interrupted every four to six weeks and either hypodermatic medication or inunctions substituted for about two weeks; which course is to be pursued during the entire time that the patient is under observation.

On return from a visit from the various venereal clinics in Europe in 1883 he found that hypodermatic medication and inunctions of mercury were relied upon as the standard method of treating the disease in determining the secondary or tertiary stage. He decided to investigate the hypodermatic method and after the study of one hundred and thirty (130) cases he read a paper giving the results of his observations before The County Medical Society which was afterwards published in the *Therapeutic Gazette* of May 19, 1894. The discussion of the paper gave rise to a most acrimonious discussion, and when the Society ad-

joined the majority dispersed believing that this method of treatment was dangerous, unsatisfactory, and one to be employed only in specially selected emergency cases. Not discouraged by this adverse view of his confrères he had continued to employ the hypodermatic method as a means of treating syphilis for the past twenty-six years and was fully convinced that when properly employed it is one of the strongest and most reliable weapons possessed by the physician wherewith to fight this disease.

It is gratifying to find that the hypodermatic treatment of syphilis is rapidly becoming the standard method employed as a routine treatment by all progressive physicians.

DR. BROOKS, in closing the discussion, said that the dangers of this method are very slight. Embolism cannot occur if the operator takes sufficient time to be sure that the needle is not in a vein.

The danger of abscess is very slight, if the technic is carefully carried out and the injections given deeply. Dr. Gottheil claims to have only had one abscess in ten years and that happened in the case of a patient treated in a dirty tenement without aseptic precautions.

A few deaths have occurred after the hypodermic injection of mercurial salts, but these are extremely rare, and it has not been proven that death was due to the fact that the drug was administered by hypodermic,—some patients have a rare idiosyncrasy for mercury and cases are reported where death has followed its administration by mouth.

Administration by mouth is very uncertain, even when the patient takes his medicine regularly, for the pills are often so old and hard that they pass through the alimentary canal undissolved.

DILATATION OF THE PROSTATIC URETHRA FOR THE RELIEF OF THE SYMPTOMS OF PROSTATIC ENLARGEMENT.

DR. E. HOLLINGSWORTH SITER said that the Bottini operation having been practically discarded, the only procedure left for the relief of the prostatic symptoms is prostatectomy. But there are so many cases that are not fit for the prolonged anæsthesia and shock of prostatectomy, that it seems some method should be devised for this class of patients.

Three and a half years ago, a patient upon whom he proposed to do a suprapubic prostatectomy did not do well with his ether

after he had opened his bladder, and he was led to try dilatation of his prostatic urethra with his finger. The results were so gratifying that he had since employed it frequently. This patient's urinary difficulties disappeared, and he heard from him recently that he had had no return of frequency and was not rising at night. His age was 65 years and owing to the fact that there had been no disturbance or injury of his ejaculatory ducts and vesicles, he had had no interruption to his sexual life.

He had since employed this procedure on some twenty cases and his results had so far been satisfactory in every way, not only as to relief of symptoms, but as to uninterrupted sexual life and no return of urinary disturbances.

The cases he had selected have been the "spread out" prostates, usually with cystitis and always somewhat run down from the effects of catheter life. He had tried it on two hard prostates but too recently (within eighteen months) to say how long the relief will last.

He had also tried combined removal of the "middle" lobe and dilatation, but these have also been too recent to estimate the permanency. He felt that this method was worth a long and continued trial. It can be employed under local anæsthesia as it is no more than a suprapubic cystotomy. There is no loss of blood, practically no shock, and the patient can be up and about in a few days. Where there is cystitis, he drains the bladder for two or three days suprapubically. Where there is no cystitis, he closes the suprapubic wound and drains through a catheter left in the urethra. The after treatment has consisted of a daily irrigation for ten days or two weeks, with urinary antiseptics by the mouth.

He thought dilatation had the following points to recommend it,—absence of shock, absence of interruption to sexual life, brevity of the operation, absence of secondary hemorrhage, quickness of recovery and absence of post-operative incontinence; and the fact that the operation can be done without waiting for the disappearance of a long continued and troublesome cystitis due to the catheter life so many prostatics lead before they come to operation.

Then again, the operation is so simple and safe that he would not hesitate to repeat in a few years or every few years, if there is no permanency to the relief, and there is a return of symptoms.

DR. JOHN B. ROBERTS said, before prostatectomy was known

to be so successful and satisfactory much relief was given in some cases of moderate prostatic enlargement by the use of large bougies introduced through the urethra into the bladder. Retrograde dilatation through a suprapubic incision ought to be even more valuable and Dr. Siter's remarks indicate its beneficial effect.

HYDATID CYST OF THE LIVER.

DR. FRANCIS T. STEWART related the history of a man, aged 19 years, who was admitted to the Pennsylvania Hospital August 25, 1909. For one year he had been suffering with epigastric pain, indigestion, and occasional attacks of vomiting; he had lost much weight. On admission he was extremely ill. The temperature was 105° F., the pulse rapid, the skin moderately jaundiced, and the mind clouded. A large mass could be felt and seen in the right hypochondrium, and above this a secondary nodule close beneath the ribs. The mass was dull on percussion, extremely hard, and moved with respiration; neither fluctuation nor fremitus could be demonstrated. The leucocytes were 15,000; the urine bile stained, turbid, acid, with a S.G. of 1011, a cloud of albumin, and a few granular casts. As he had seen two somewhat similar cases, which, on exploration, proved to be sarcoma of the liver, he made this diagnosis, and suggested exploration with the hope that he was wrong and that some condition amenable to surgical treatment would be found. In two days the temperature fell to normal and the patient was much improved. The abdomen was then opened and a hard, whitish mass protruding from the convex surface of the liver disclosed. The secondary nodule previously mentioned was about one inch in diameter and not connected with the larger mass; it was excised to corroborate the diagnosis, but on incision was found to be a cyst with a white lining and clear contents. The larger growth was then punctured; and finally incised; it had an extremely hard and thick wall lined with a softer layer, and contained about two quarts of fluid and white, spherical, daughter cysts, ranging in size from a pea to a hen's egg. Scolices, hooklets, and cholesterin crystals were found in the fluid. The mother cyst occupied the right lobe of the liver and was about 10 inches longitudinally and 8 inches transversely; it was enucleated and the cavity painted with iodine, sutured to the abdominal wall, and packed with gauze. A large quantity of bile subsequently flowed from the wound, but the cavity rapidly contracted and healing was complete in nine weeks.

BOOK REVIEWS.

SURGICAL DIAGNOSIS. By EDWARD MARTIN, M.D., Professor of Clinical Surgery in the University of Pennsylvania. Lea & Febiger, Philadelphia and New York, 1909.

Since the responsibility of the early recognition of a surgical condition rests almost wholly with the attending physician, it is for his benefit and instruction that the work of Dr. Martin has been written. Just as a surgeon must be versed in medical diagnosis so must an internist be instructed in surgical diagnosis. It is not necessary that he should be capable of making a minute and detailed diagnosis, but it is essential that he should recognize the transition from the medical to the surgical side. Dr. Martin says, "It often happens that when the disease is so fully developed that the diagnosis can be made beyond doubt, the time for surgical intervention is past." This should not be taken too literally, for there are many exceptions. If, for instance, a cancer of the breast is not recognized as possibly or probably such until the dense induration, skin adhesion, nodular lymphatic glands and cachexia proves its nature, the only possible result, according to Martin, accruing to the patient is the knowledge that she will have but little time to live and that she will suffer much.

The subject matter takes up first Laboratory Diagnosis; the writer does not go into the details of this subject, omitting the technic and explaining the importance of the examinations as applied to Surgical Diagnosis. The second chapter, the application of the X-ray in Surgical Diagnosis, has been written by H. K. Pancoast, and adds an interesting but short treatise on the subject.

With the exception of the chapter on Gynæcological Diagnosis, which is written by Dr. Anspach, and the chapter on the Diagnosis of Nervous Affections, by Dr. Wiesenburg, and a section devoted to the Eye by Dr. de Schweinitz, the entire volume has been prepared by Dr. Martin. He presents the subject in a systematic, careful way, laying special stress upon

the symptoms of major and deciding moment. Each lesion is taken up and treated as a whole, thus bringing out more prominently the associated lesions. The work is decidedly one for the general practitioner and student of surgery, and in no part does it go into the finer details of special diagnosis. This is especially apparent in the department of Diseases of the Genito-Urinary system, where our methods of examination have been revolutionized by the introduction of the cystoscope. The illustrations throughout are good.

SURGICAL DIAGNOSIS. By ALEXANDER BRYAN JOHNSON, PH.B., M.D., Professor of Clinical Surgery in the Columbia University Medical School, etc. D. Appleton & Co., New York and London, 1909.

No one can expect to become proficient in surgical diagnosis without first having thoroughly mastered the essentials of the practical side of medical diagnosis. To suppose that a book on surgical diagnosis is for a student of medicine is as impossible as to think of taking up the higher branches of mathematics without first having mastered algebra and geometry. Dr. Johnson has been a student and teacher of surgery for nearly twenty-five years, and during that time has spent most of his time in the surgical wards of Bellevue, The Roosevelt and New York Hospitals. During that time he was greatly impressed with the necessity of instructing the practitioner of general medicine with the essentials of surgical diagnosis, for surgeons are constantly receiving patients who, for days, have been suffering from an acute or advanced surgical disease which has been unrecognized by the practitioner, and the patient is found in a state of advanced disease where surgical intervention has become a matter of absolute necessity, and where the chances of recovery are greatly minimized on account of the time lost by the practitioner in referring the case for surgical diagnosis. In order to present this subject in a comprehensive manner the author has thought it advisable to add some pathological data, and many of the points which he has brought out are emphasized by illustrative cases.

VOLUME I treats of Wounds and their diseases; Diseases of the Soft Parts, of the Bones; Tumors, Fractures, and Dislocations; Syphilis; the X-ray; the Head and Neck; Thorax and

Breast, and Abdomen in general; the peritoneum and the special abdominal organs. This volume resembles somewhat the first volume of a general treatise on surgery in that the subjects are treated in a general way, bringing out the signs and symptoms of surgical diseases in general. The volume also contains a very valuable treatise on X-rays in surgical diagnosis, going into the minutest details of the apparatus; the technic, and the diagnostic value of the X-rays in injuries and disease. This, of course, includes its use in fractures, but in a general way.

VOLUME II is devoted to injuries and diseases of the Abdomen and its viscera, including the entire genito-urinary system. It is impossible to go over in detail the special points of interest in each section, but one remarks the especial interest and large amount of space which is devoted to surgery of the kidneys and ureter, and also the bladder. In some respects these chapters are the best that have ever appeared upon this branch of surgery, which is rapidly coming to be of considerable importance. It is really the first work of a general character in which there has been any attempt to recognize the value of the American methods of examination and the superiority of American instruments in the diagnosis of kidney lesions. The illustrations accompanying these sections, while not always original, are well chosen.

VOLUME III takes up the Spine, the Nerves, the Pelvis and the Extremities, and contains also an Appendix which takes up some of the more recent methods of diagnosis that have been introduced since the earlier chapters were written.

The first chapters dealing with injuries of the Spine and Spinal Cord are well worked out, being in some respects a compilation of the writings of others adapted to surgical diagnosis. The consideration of diseases of the spine is less technical and more interesting.

The section on injuries to the Shoulder and vicinity is especially good, and the illustrations are both numerous and well chosen.

The author takes up a certain region of the body and describes in turn all of the surgical conditions which may arise there. This is a distinct advantage to the student and gives a much more comprehensive view of the subject. It is also more logical to consider the associated lesions as many of them occur in the same case. It makes less repetition.

Throughout this volume the bone lesions are given a prominent place. The X-ray pictures and the numerous photographs of old bone lesions add greatly to the text. The extensive experience which the author has had in this branch of the work makes his opinion authoritative.

In discussing the injuries of the Wrist and Hand a great deal of space has been given to the consideration of the anatomy of the parts. All those who have had much of this work to do realize the importance of this addition, for the proper conservative treatment of hand injuries, and the avoidance of unnecessary mutilation often depends on the fundamental knowledge of the exact anatomy of this part.

About sixty pages are devoted to a study of diseases and injuries of the Knee Joint, a subject on which volumes have already been written, but the author has condensed the subject and presented it in a masterly way.

In considering the three volumes together we find that Dr. Johnson has completed a work which must be considered as authority. His long and continuous service in New York hospitals and his close associations with many of the masters of surgery during its developmental period, has fitted him for this task of which he has so well acquitted himself. He is to be congratulated on the completion of his work.

PAUL M. PILCHER.

PREPARATORY AND AFTER TREATMENT IN OPERATIVE CASES.

By HERMAN A. HAUBOLD, M.D., Clinical Professor in Surgery and Demonstrator of Operative Surgery, New York University and Bellevue Hospital Medical College, New York, etc. New York and London, D. Appleton and Company, 1910.

The author of this book is one of those surgeons who understand the position of the general practitioner in regard to the patients who require the attentions of an expert, which the practitioner can not give. He is also in sympathy with the physician, who, having studied his patient, lived with him, and discovered the necessity for operation, at last sees him taken hold of by a man who operates, takes his money, and sends him back to his family or is responsible for having him placed in other

hands for further observation and treatment. Dr. Haubold believes that there should be a closer co-operation between the family physician and the surgeon, that the former should understand the preparation of patients for operation, that he should have an intelligent appreciation of the operation, and that he should be able to conduct the after care of the patient. He believes that the physician should be compensated for these special services, and that, if this were followed, the evils of losing his patient on the one hand or dividing the fee of the surgeon on the other would not come so much into play.

It may be said by some, that, while this co-operation is desirable in certain instances, still in a large proportion of cases not only is special surgical skill required but the family physician is neither qualified by temperament, understanding or experience to be entrusted with any surgical responsibility; and that there is a further large proportion of cases in which the surgeon recognizes that there has been distinct culpability of treatment upon the part of the physician. These matters are beside the mark because the author of this book takes the stand that the physician should be better educated in surgery questions than is now the case. It is to this end that this book has been prepared, to make the physician a more competent ally of the surgeon.

There are thirty-four chapters. They deal with the essentials of preparation for operation, the patient, instruments, dressings, materials, solutions, assistants, and the operating room. Then the treatment of the wound is taken up, suturing, drainage, dressing, stock, hemorrhage, postoperative complications, and feeding. Operations in different regions are discussed, the head, face, neck, thorax, spine, abdomen, female pelvic organs, urinary organs, and extremities. The text is illustrated with 429 pictures, all good and having practical application.

It is observed that the author regards most men as alcoholics, and he does not seem inclined to withdraw their alcohol. Diabetics he deprives of their wonten amount of carbohydrates. The names of the manufacturers of instruments and materials appear with extraordinary frequency in the illustrations; and while they are those of well known and reputable firms, and are attached to the electrotypes evidently loaned to the author, the wisdom of accepting courtesies of this sort from commercial houses in the interest of economy is doubtful.

It is satisfactory to find Pasteur referred to as the originator of the principles underlying surgical sterilization.

This text was written, perhaps, before the introduction of clean catgut into surgery, as German banjo and violin strings are recommended; but fortunately as the result of recent agitation catgut is now being prepared especially for surgical purposes, and a new era in the preparation of this important material has been entered upon.

The administration of sterile foods as a preliminary to stomach and intestinal operations is given all too little consideration in practice; and one of the strong features of this book is the practical and scientific presentation of this subject. If the methods set forth in this work were adopted in every hospital it is fair to presume that the mortality in gastro-intestinal surgery would be distinctly lowered.

In general it may be said of this book that it fills a place in surgery and should be a distinct help in bringing about a better preparatory and after-treatment in operative cases. While it deals with a wide field of surgery, still it can not be said that it wanders from its text. It displays the individuality of the author, and above all possesses the merit of being useful.

The publishers have done a good piece of book-making. The paper is better than is being given to most medical publications. It is to be hoped that the book will find a large appreciation.

J. P. WARBASSE.

URGENT SURGERY. By FÉLIX LEJARS of Paris. Translated from the Sixth French Edition by WILLIAM S. DICKIE, F.R.C.S. Vol. I. New York, William Wood and Company, 1910.

The author of this book does not mean by urgent surgery the surgery of injuries, but that of conditions demanding immediate surgical action, as distinguished from conditions which are distinctly not matters of emergency. If this book has any especial mission, it is to give the surgeon an understanding not only of the diseases demanding immediate surgical attention, but the nature of the attention which they should receive; and for the general practitioner it can perform the distinct service of informing him of the possibilities of surgery and remove from his mind the vague conceptions of what surgery may do for his acutely sick patient.

A feature of the book is that the translator has not edited it, for which reason the reader is brought into immediate touch with the methods of one of the best of French surgeons.

The introductory chapter deals with the equipment and the carrying out of emergency operations. As an example, the author takes the case of an operation required to be done in the country, in which there is extreme urgency with complete lack of necessaries. He shows the things of the household which may be used and how to use them for surgical purposes. This chapter deals also with anæsthesia of all types, infusions, and dressings.

The rest of the book is divided into sections dealing respectively with the head, neck, thorax, spine, and abdomen. Vol. II, it is presumed, will deal with the extremities and the parts not included in this first volume. Much that is not found in the ordinary general surgeries is presented in these chapters. Thus the emergency surgery of the eye is well presented, and such operations as paracentesis of the anterior chamber, emptying the globus, and enucleation are described. The suturing of wounds of the eye is illustrated with good pictures.

Tracheotomy and intubations would naturally be found well presented in such a work. The author deals with foreign bodies in the œsophagus and trachea in practical fashion. Most surgical literature treats of such foreign bodies as can be studied, and leisurely attacked; but it is true that many of these cases are of great urgency. The author displays an admirable activity in doing the thing for the patient's relief at once.

Wounds of the heart, foreign bodies in the heart, and empyema, receive practical treatment without procrastination. In discussing injuries to the cord attention is called to the importance of the deep reflexes. "If the tendon reflexes are preserved, even partially, a complete irremedial lesion of the cord may be excluded; but their absence during the first few days is not in itself conclusive, as the loss may be transitory."

The keynote to the treatment of injuries to the abdomen is to operate in doubtful cases. In these cases, "when there is a disagreement between the pulse and the temperature, it is the pulse which must be believed." Having opened the abdomen, the author takes up each condition that may be encountered, and applies the best treatment. A variety of hypothetic conditions

are described, more than will be found in the larger works on surgery. The surgeon who is familiar with this chapter will not be at a loss to know the approved treatment of any abdominal injury.

Under the section on the abdomen, are found also wounds and rupture of the kidney, ureter, and bladder. The urgent surgery of the uterus is also presented. This includes rupture of the uterus during labor. The author advises hysterectomy for the latter condition. The emergency operations upon the stomach and intestines are well described. Concerning appendicitis, the author agrees with the general consensus of opinion of American surgeons.

This is a valuable book, chiefly because of the large number of conditions, complications and combinations of urgent surgical diseases and injuries which it discusses. It has a distinctly French atmosphere. There are the French restlessness and energy, guided by the scientific intelligence which carries them to the mark. It is the surgery of the intensive life.

J. P. WARBASSE.

A TEXT-BOOK OF SURGERY. For Students and Practitioners. By GEORGE EMERSON BREWER, A.M., M.D., Professor of Clinical Surgery at the College of Physicians and Surgeons, Columbia University, New York; Surgeon to the Roosevelt Hospital, etc. Second edition; octavo; 915 pages. New York and Philadelphia, Lea & Febiger, 1909.

In this second edition of his book Dr. Brewer has treated his subjects in a less cursory manner. He has added new material and many excellent colored illustrations—this edition is two hundred pages larger than the first.

The first four chapters are devoted to inflammation and surgical diseases. The chapter on Tumors gives a definition of each of the growths we are in the habit of seeing: it gives also a suggestion as to treatment and is well illustrated. The chapter on Shock and its allied conditions gives a summary of our present knowledge, on these subjects.

After chapters on Surgical Technic and Anæsthesia, which contain nothing new except perhaps the illustration of Sutton's apparatus for colonic anæsthesia, the author takes up the injuries

and diseases which are apt to occur in the different structures. The short article on neuralgia is perhaps the most satisfactory one in these chapters. Every subject is briefly reviewed and the author's individual method of handling the condition indicated. We find suggestions as to surgical technic which the author has evidently found of value in his large experience. After a brief review of injuries and diseases of the joints, the book gives us chapters on Fractures, Dislocations, Hernia and Amputations; and closes with a chapter on Deformities and their corrections.

Dr. Brewer has succeeded in this book in giving in a crisp, didactic manner most of the essential facts of surgery as it is practised to-day.

WILLIAM B. BRINSMADE.

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